TD6020"H/ETD660

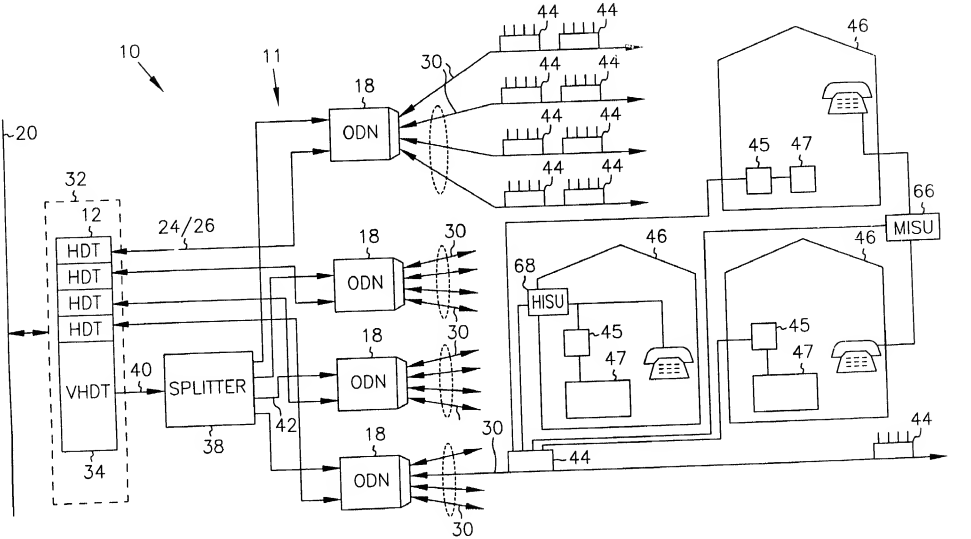


FIG. 1

TOSOZO "WZETOSSO

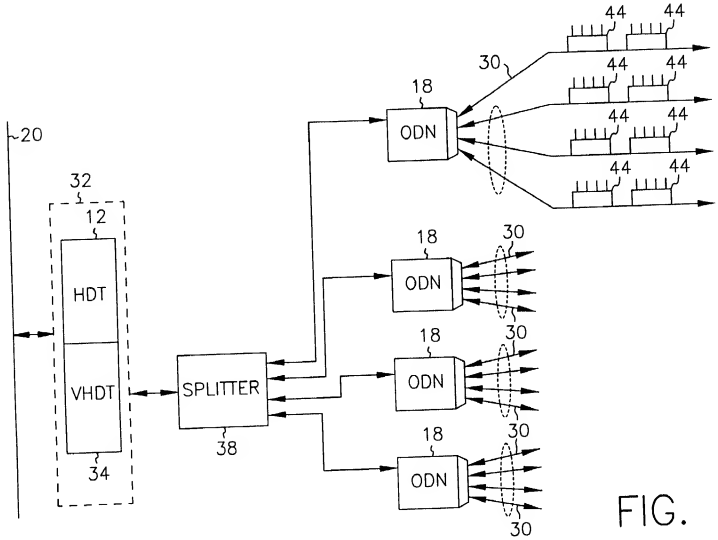


FIG. 2

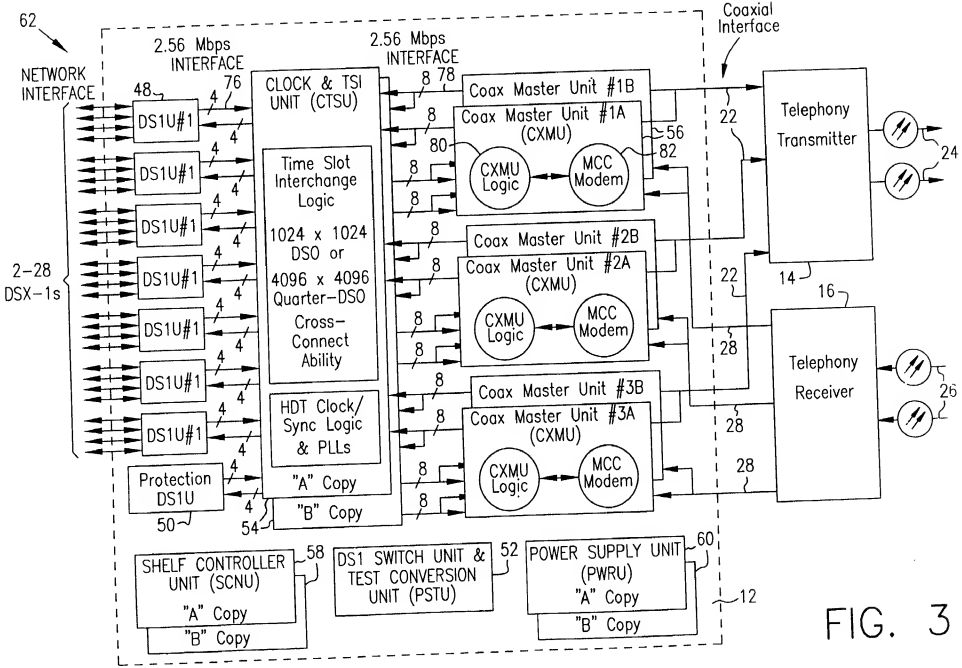
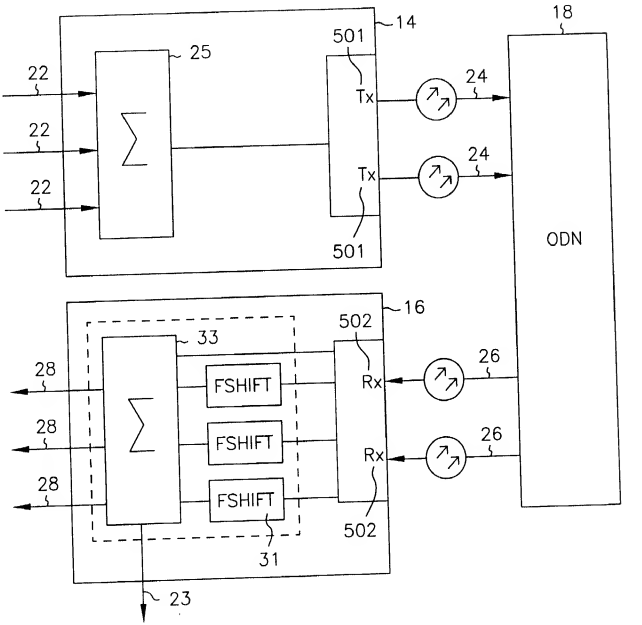

62
NETWORK INTERFACE
2.56 Mbps INTERFACE
48
76
DS1U#1
2-28 DSX-1s
CLOCK & TSI UNIT (CTSU)
Time Slot Interchange Logic
1024 x 1024 DSO or
4096 x 4096 Quarter-DSO
Cross-Connect Ability
HDT Clock/ Sync Logic & PLLs
"A" Copy
"B" Copy
Protection DS1U
50
54
2.56 Mbps INTERFACE
8
78
80
Coax Master Unit #1B
Coax Master Unit #1A (CXMU)
CXMU Logic
MCC Modem
56
82
Coax Master Unit #2B
Coax Master Unit #2A (CXMU)
Coax Master Unit #3B
Coax Master Unit #3A (CXMU)
Coaxial Interface
22
Telephony Transmitter
24
14
16
28
Telephony Receiver
26
SHELF CONTROLLER UNIT (SCNU)
"A" Copy
"B" Copy
58
DS1 SWITCH UNIT & TEST CONVERSION UNIT (PSTU)
52
POWER SUPPLY UNIT (PWRU)
"A" Copy
"B" Copy
60
12

FIG. 3

FIG. 4


14
18
501
25
22
22
22
Tx
Tx
24
24
501
ODN
16
502
33
28
28
28
FSHIFT
FSHIFT
FSHIFT
Rx
Rx
26
26
502
31
23

T0600/0 "4/27/0660

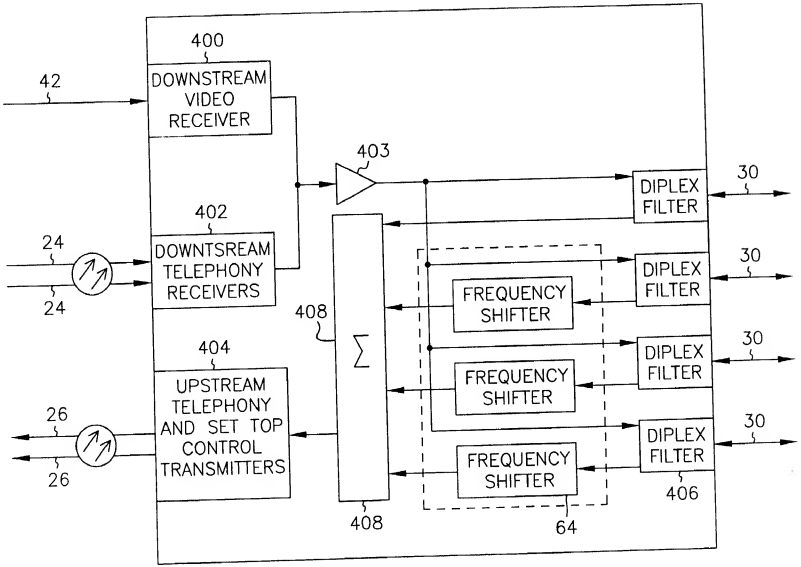


FIG. 5

TOSHIBA KABUSHIKI KAISHA

FIG. 6

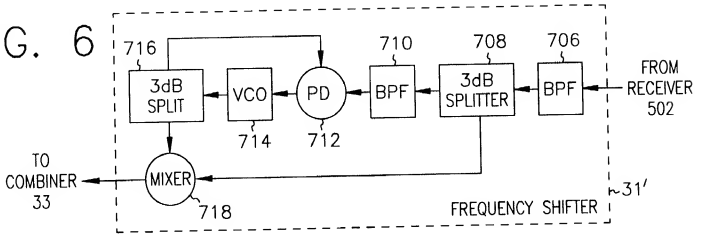
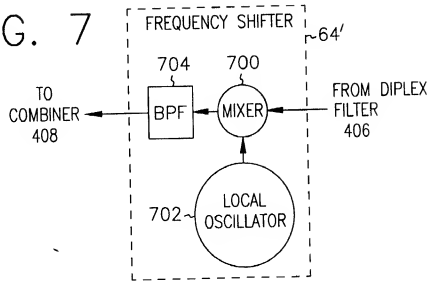


FIG. 7



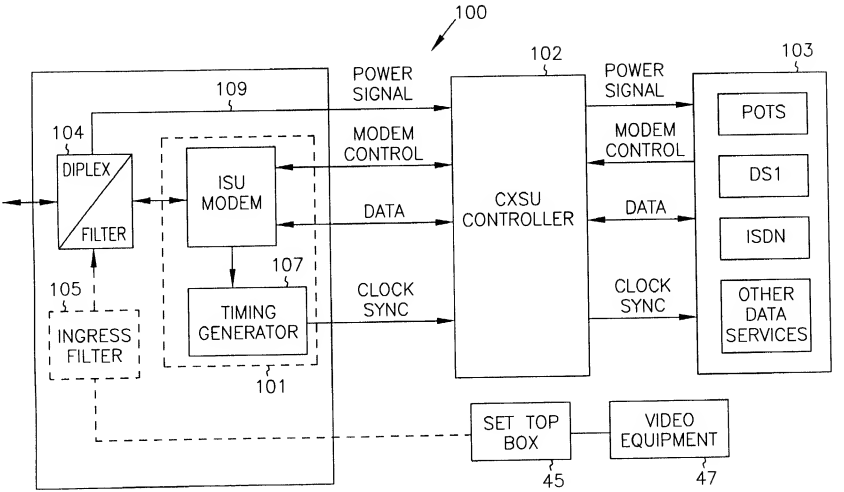

100
102
103
109
POWER SIGNAL
POWER SIGNAL
104
DIPLEX
FILTER
ISU MODEM
MODEM CONTROL
MODEM CONTROL
DATA
CXSU CONTROLLER
DATA
POTS
DS1
ISDN
OTHER DATA SERVICES
107
105
INGRESS FILTER
TIMING GENERATOR
CLOCK SYNC
CLOCK SYNC
101
SET TOP BOX
VIDEO EQUIPMENT
45
47

FIG. 8

T06020"h2ET0660

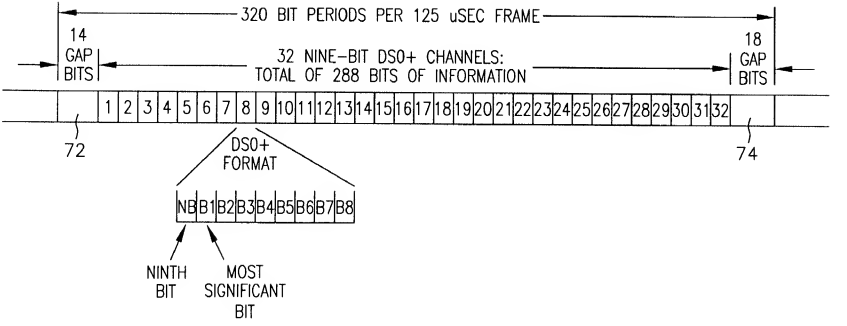


FIG. 9

T0602G "4ZE0660

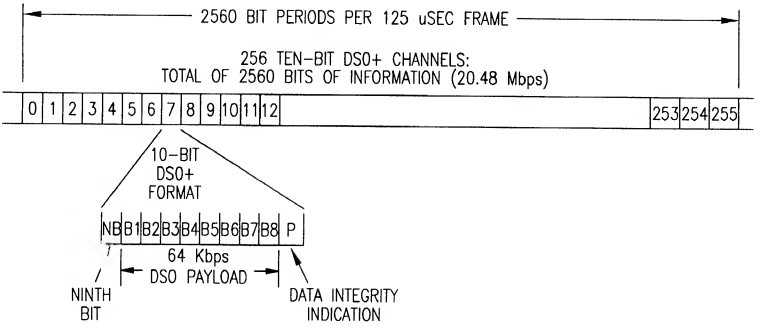


FIG. 10

T06020 "4267D660

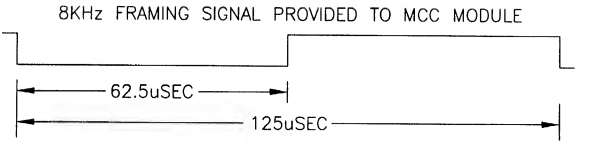


FIG. 11

T0600 "b2T0666

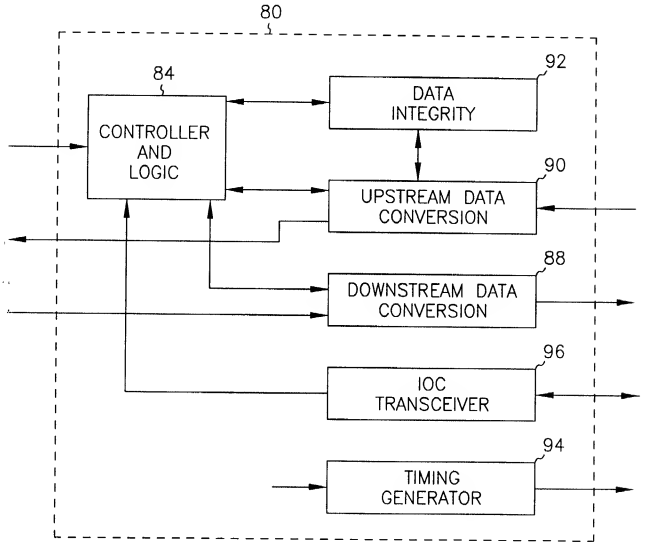


FIG. 12

T06020 "4/27/0660

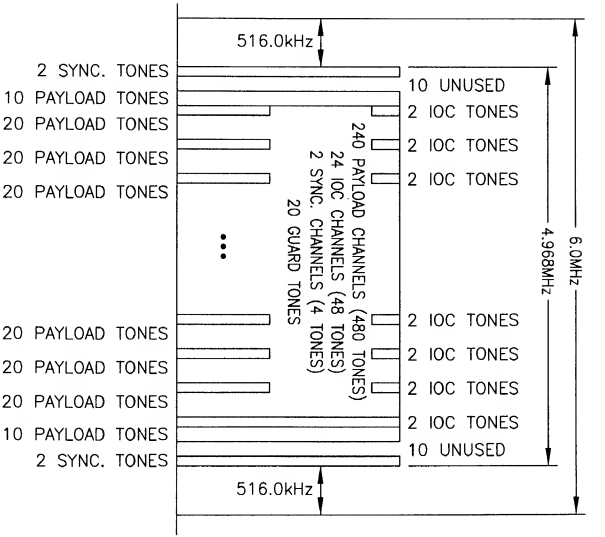


FIG. 13

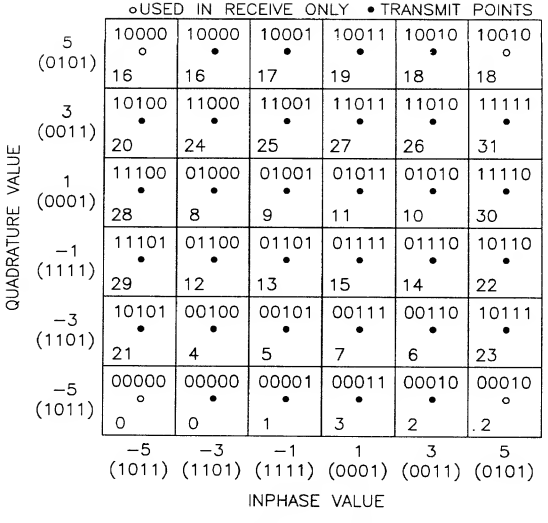

o USED IN RECEIVE ONLY • TRANSMIT POINTS
QUADRATURE VALUE
5 (0101)
3 (0011)
1 (0001)
−1 (1111)
−3 (1101)
−5 (1011)
10000 16
10000 16
10001 17
10011 19
10010 18
10010 18
10100 20
11000 24
11001 25
11011 27
11010 26
11111 31
11100 28
01000 8
01001 9
01011 11
01010 10
11110 30
11101 29
01100 12
01101 13
01111 15
01110 14
10110 22
10101 21
00100 4
00101 5
00111 7
00110 6
10111 23
00000 0
00000 0
00001 1
00011 3
00010 2
00010 2
−5 (1011)
−3 (1101)
−1 (1111)
1 (0001)
3 (0011)
5 (0101)
INPHASE VALUE

FIG. 14

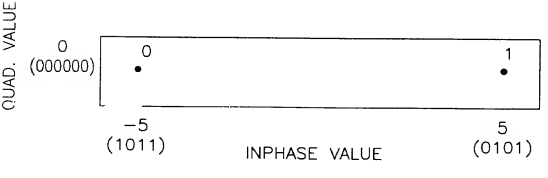

QUAD. VALUE
0 (000000)
0
1
−5 (1011)
5 (0101)
INPHASE VALUE

FIG. 15

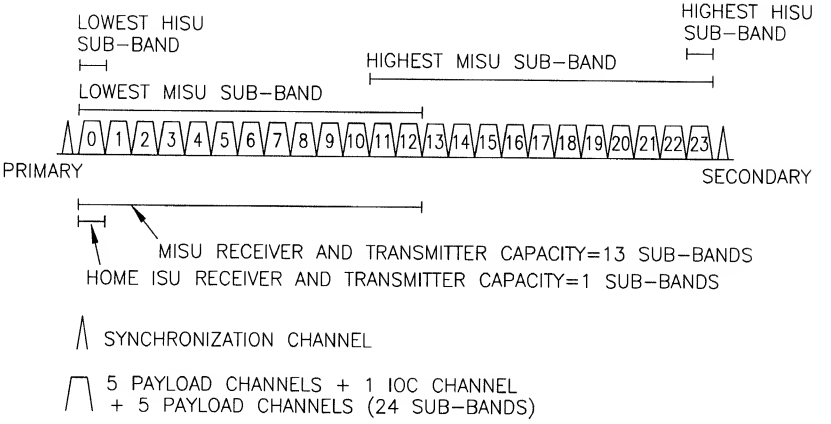

LOWEST HISU SUB-BAND
HIGHEST HISU SUB-BAND
HIGHEST MISU SUB-BAND
LOWEST MISU SUB-BAND
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
PRIMARY
SECONDARY
MISU RECEIVER AND TRANSMITTER CAPACITY=13 SUB-BANDS
HOME ISU RECEIVER AND TRANSMITTER CAPACITY=1 SUB-BANDS
SYNCHRONIZATION CHANNEL
5 PAYLOAD CHANNELS + 1 IOC CHANNEL
+ 5 PAYLOAD CHANNELS (24 SUB-BANDS)

FIG. 16

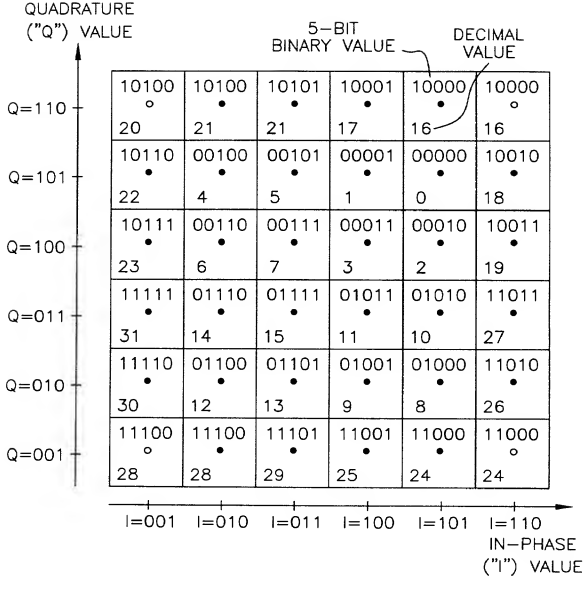

QUADRATURE ("Q") VALUE
5-BIT BINARY VALUE
DECIMAL VALUE
Q=110
Q=101
Q=100
Q=011
Q=010
Q=001
10100 20
10100 21
10101 21
10001 17
10000 16
10000 16
10110 22
00100 4
00101 5
00001 1
00000 0
10010 18
10111 23
00110 6
00111 7
00011 3
00010 2
10011 19
11111 31
01110 14
01111 15
01011 11
01010 10
11011 27
11110 30
01100 12
01101 13
01001 9
01000 8
11010 26
11100 28
11100 28
11101 29
11001 25
11000 24
11000 24
I=001
I=010
I=011
I=100
I=101
I=110
IN-PHASE ("I") VALUE

FIG. 17

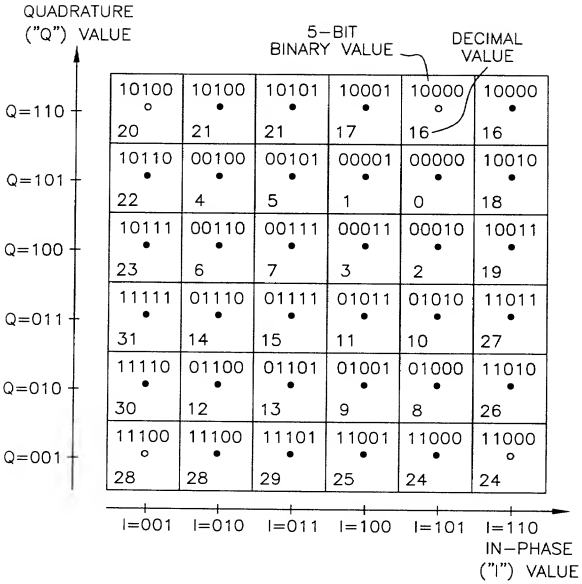

QUADRATURE
("Q") VALUE
5-BIT
BINARY VALUE
DECIMAL
VALUE
Q=110
Q=101
Q=100
Q=011
Q=010
Q=001
10100 20
10100 21
10101 21
10001 17
10000 16
10000 16
10110 22
00100 4
00101 5
00001 1
00000 0
10010 18
10111 23
00110 6
00111 7
00011 3
00010 2
10011 19
11111 31
01110 14
01111 15
01011 11
01010 10
11011 27
11110 30
01100 12
01101 13
01001 9
01000 8
11010 26
11100 28
11100 28
11101 29
11001 25
11000 24
11000 24
I=001
I=010
I=011
I=100
I=101
I=110
IN-PHASE
("I") VALUE

FIG. 18

T0660 "WO2T0660

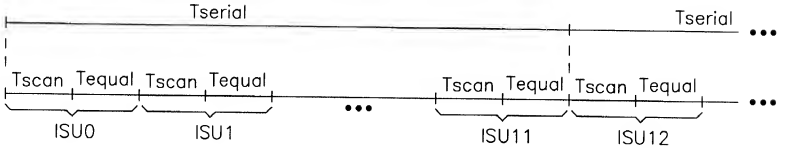


FIG. 19

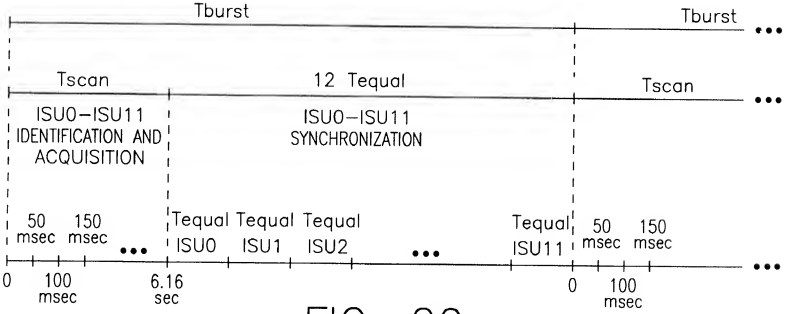


FIG. 20

T06020 "4ZET060

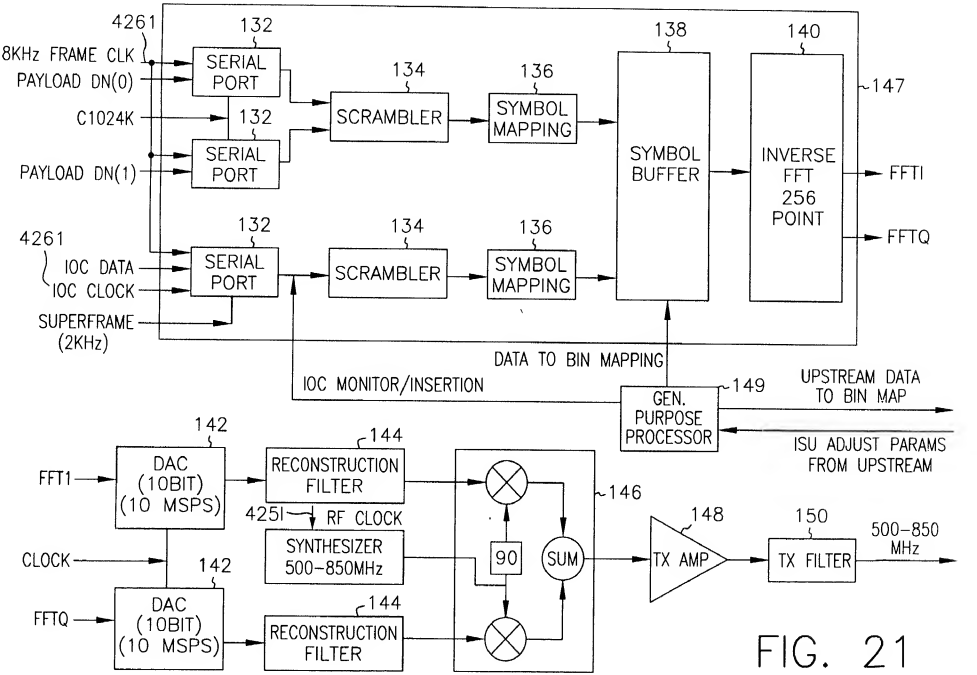


FIG. 21

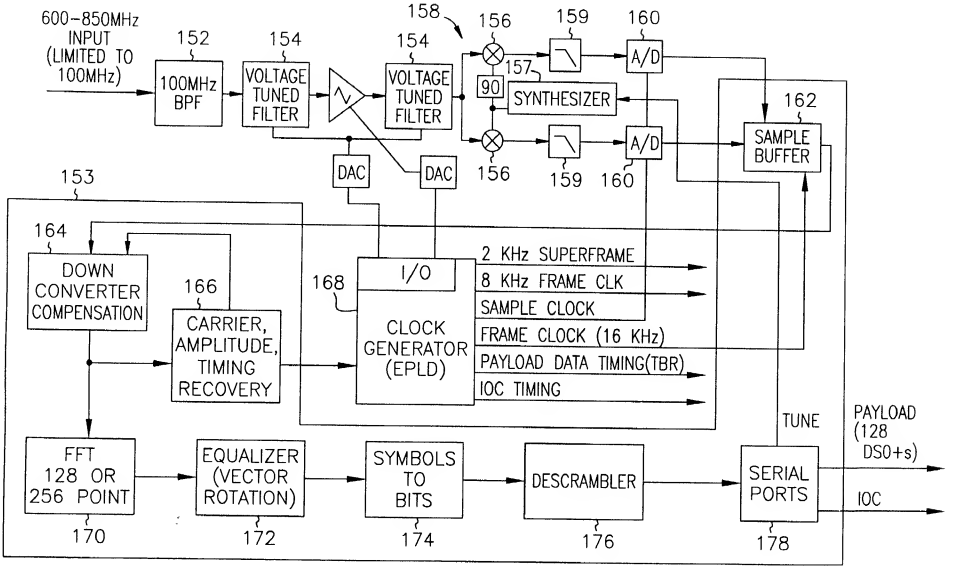

600-850MHz
INPUT
(LIMITED TO
100MHz)
152
100MHz
BPF
154
VOLTAGE
TUNED
FILTER
154
VOLTAGE
TUNED
FILTER
158
156
159
160
157
90
SYNTHESIZER
A/D
A/D
162
SAMPLE
BUFFER
DAC
DAC
156
159
160
153
164
DOWN
CONVERTER
COMPENSATION
166
CARRIER,
AMPLITUDE,
TIMING
RECOVERY
168
I/O
CLOCK
GENERATOR
(EPLD)
2 KHz SUPERFRAME
8 KHz FRAME CLK
SAMPLE CLOCK
FRAME CLOCK (16 KHz)
PAYLOAD DATA TIMING(TBR)
IOC TIMING
TUNE
PAYLOAD
(128
DS0+s)
IOC
FFT
128 OR
256 POINT
170
EQUALIZER
(VECTOR
ROTATION)
172
SYMBOLS
TO
BITS
174
DESCRAMBLER
176
SERIAL
PORTS
178

FIG. 22

T06020 HZET0660

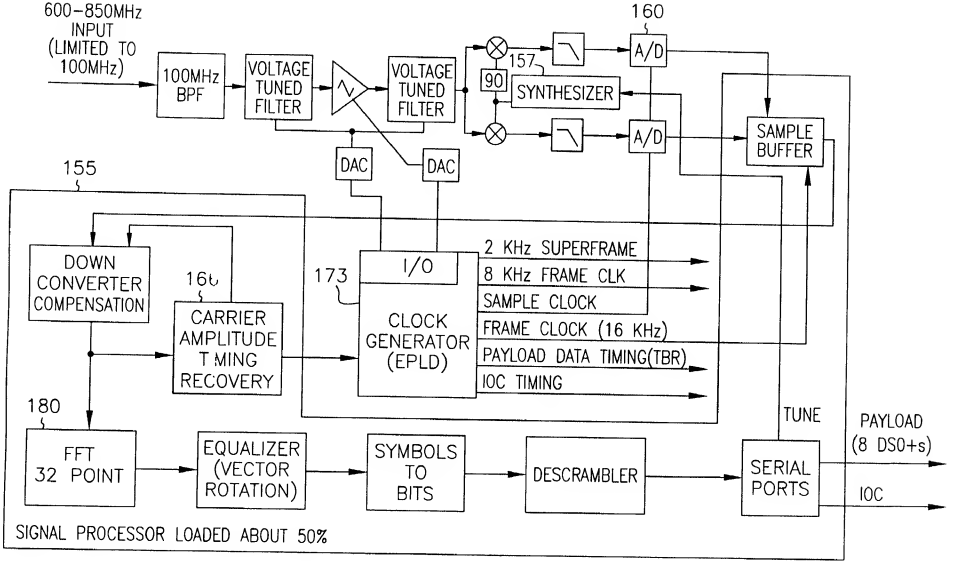


FIG. 23

TOSHIBA EXHIBIT 1060

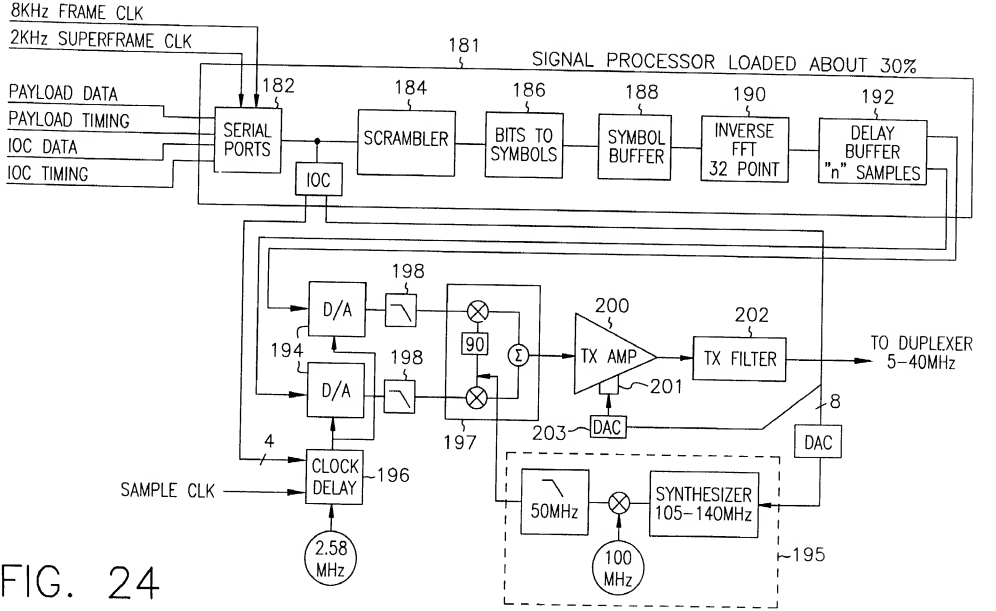


FIG. 24

TD60/0 HZETOGO

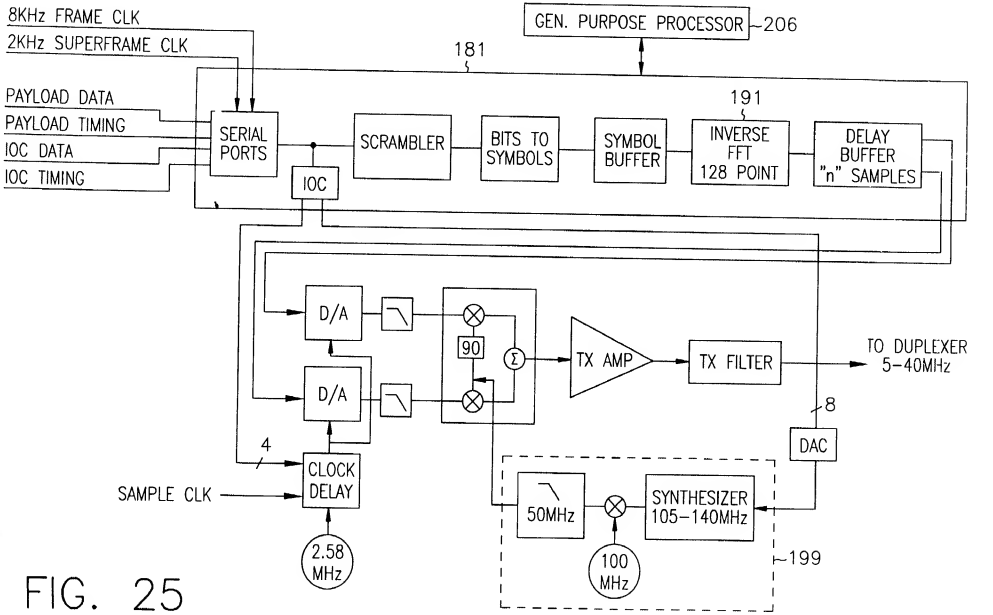


FIG. 25

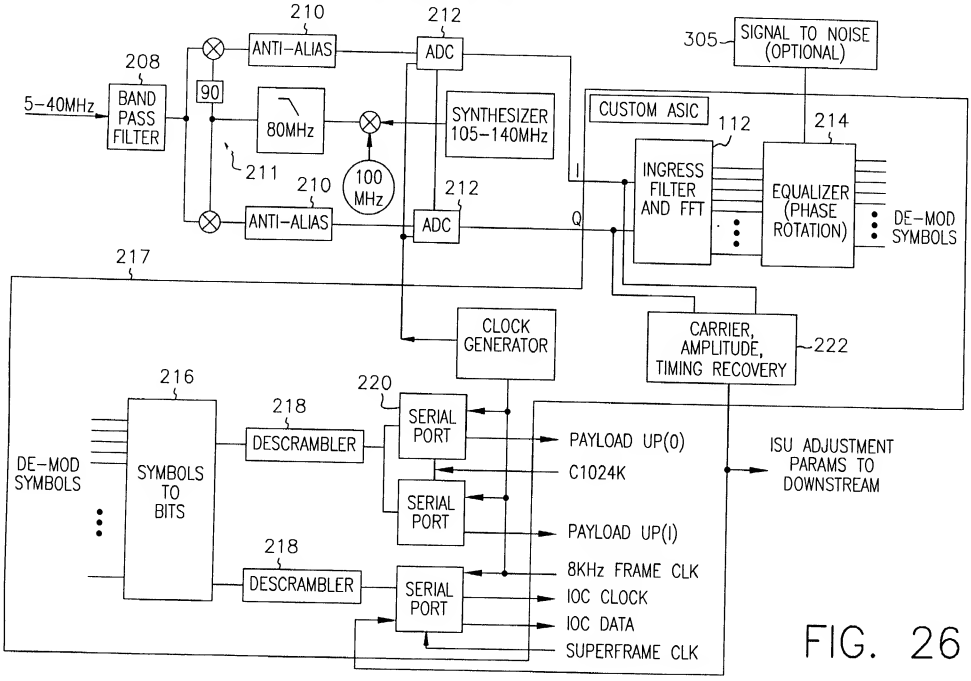

210
212
ANTI-ALIAS
ADC
208
BAND PASS FILTER
5-40MHz
90
80MHz
SYNTHESIZER 105-140MHz
211
100 MHz
210
212
ANTI-ALIAS
ADC
I
Q
305
SIGNAL TO NOISE (OPTIONAL)
CUSTOM ASIC
112
214
INGRESS FILTER AND FFT
EQUALIZER (PHASE ROTATION)
DE-MOD SYMBOLS
217
CLOCK GENERATOR
CARRIER, AMPLITUDE, TIMING RECOVERY
222
216
220
218
SERIAL PORT
DESCRAMBLER
DE-MOD SYMBOLS
SYMBOLS TO BITS
PAYLOAD UP(0)
C1024K
ISU ADJUSTMENT PARAMS TO DOWNSTREAM
PAYLOAD UP(I)
8KHz FRAME CLK
IOC CLOCK
IOC DATA
SUPERFRAME CLK

FIG. 26

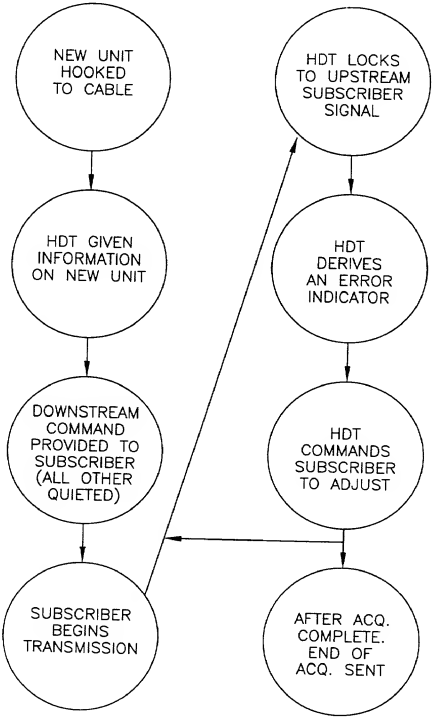

NEW UNIT HOOKED TO CABLE
HDT GIVEN INFORMATION ON NEW UNIT
DOWNSTREAM COMMAND PROVIDED TO SUBSCRIBER (ALL OTHER QUIETED)
SUBSCRIBER BEGINS TRANSMISSION
HDT LOCKS TO UPSTREAM SUBSCRIBER SIGNAL
HDT DERIVES AN ERROR INDICATOR
HDT COMMANDS SUBSCRIBER TO ADJUST
AFTER ACQ. COMPLETE. END OF ACQ. SENT

FIG. 27

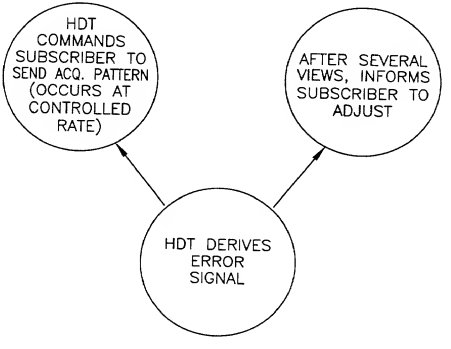

HDT COMMANDS SUBSCRIBER TO SEND ACQ. PATTERN (OCCURS AT CONTROLLED RATE)
AFTER SEVERAL VIEWS, INFORMS SUBSCRIBER TO ADJUST
HDT DERIVES ERROR SIGNAL

FIG. 28

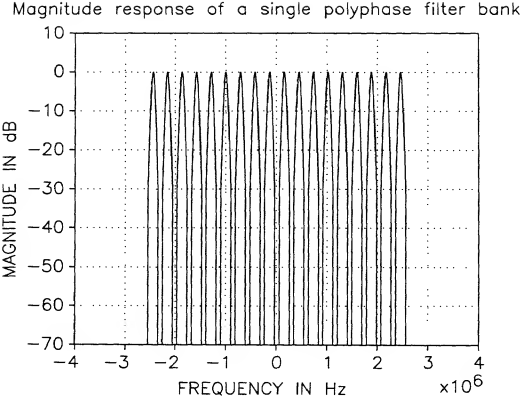

Magnitude response of a single polyphase filter bank
10
0
−10
−20
−30
−40
−50
−60
−70
MAGNITUDE IN dB
−4
−3
−2
−1
0
1
2
3
4
FREQUENCY IN Hz
x10^6

FIG. 29

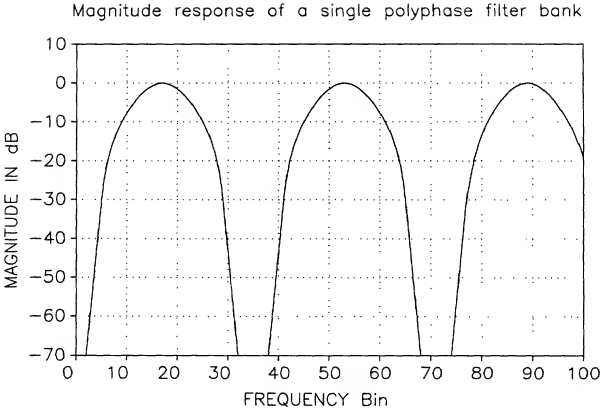

Magnitude response of a single polyphase filter bank
MAGNITUDE IN dB
10
0
−10
−20
−30
−40
−50
−60
−70
0
10
20
30
40
50
60
70
80
90
100
FREQUENCY Bin

FIG. 30

D0602D'4ZETD660

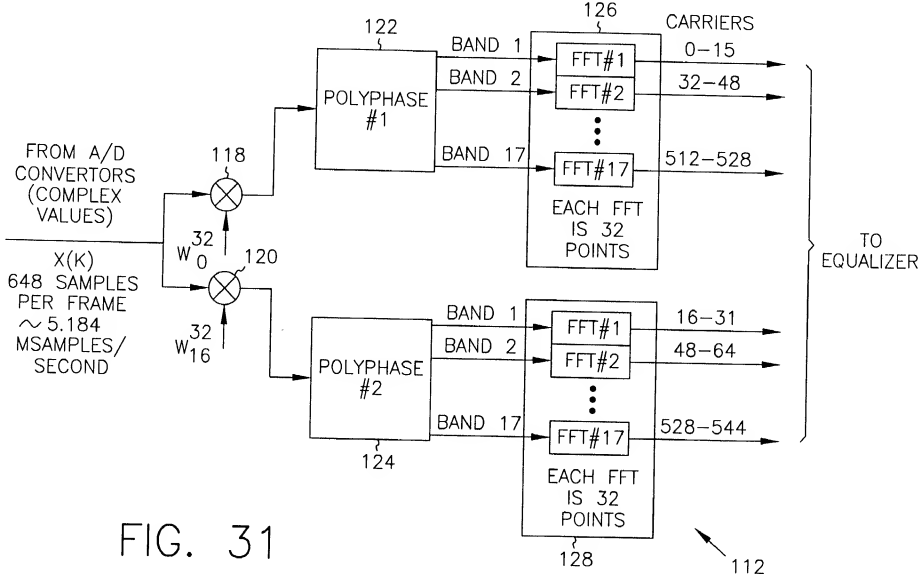


FIG. 31

T06020 "hZ2T0660

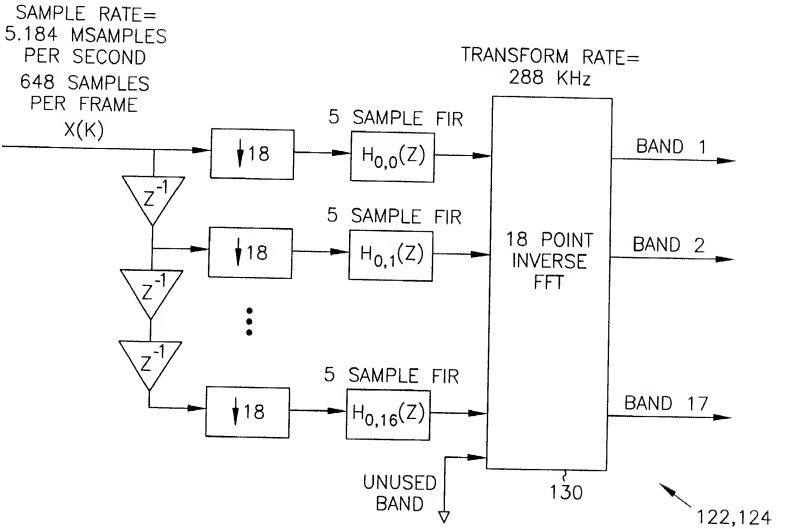


FIG. 32

FIG. 33

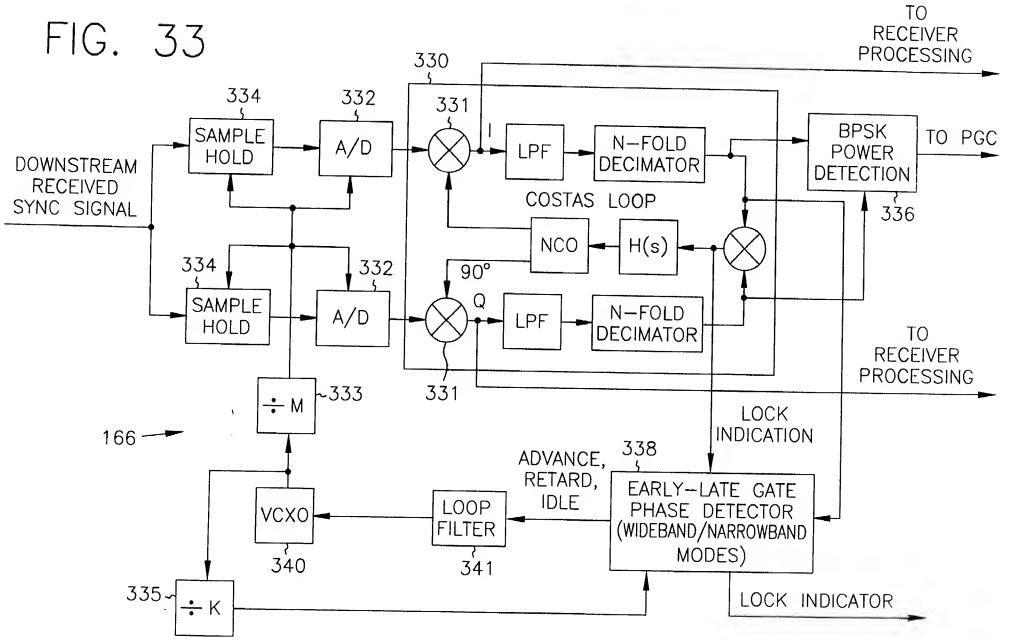
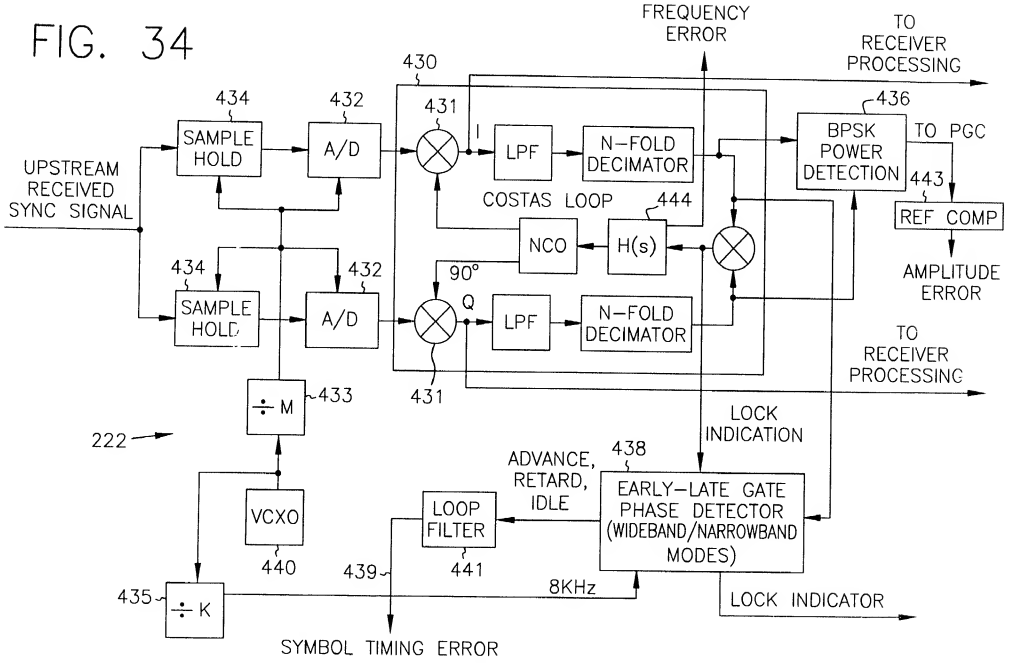

TO RECEIVER PROCESSING
330
334
332
331
SAMPLE HOLD
A/D
I
LPF
N–FOLD DECIMATOR
BPSK POWER DETECTION
TO PGC
DOWNSTREAM RECEIVED SYNC SIGNAL
COSTAS LOOP
NCO
H(s)
336
334
332
90°
SAMPLE HOLD
A/D
Q
LPF
N–FOLD DECIMATOR
TO RECEIVER PROCESSING
÷ M
333
331
LOCK INDICATION
166
ADVANCE, RETARD, IDLE
338
EARLY–LATE GATE PHASE DETECTOR (WIDEBAND/NARROWBAND MODES)
VCXO
LOOP FILTER
340
341
335
÷ K
LOCK INDICATOR

FIG. 34


FREQUENCY ERROR
TO RECEIVER PROCESSING
430
434
432
431
436
SAMPLE HOLD
A/D
I
LPF
N-FOLD DECIMATOR
BPSK POWER DETECTION
TO PGC
UPSTREAM RECEIVED SYNC SIGNAL
COSTAS LOOP
444
443
REF COMP
NCO
H(s)
90°
AMPLITUDE ERROR
Q
TO RECEIVER PROCESSING
÷ M
433
LOCK INDICATION
222
ADVANCE, RETARD, IDLE
438
EARLY-LATE GATE PHASE DETECTOR (WIDEBAND/NARROWBAND MODES)
VCXO
LOOP FILTER
440
439
441
8KHz
435
÷ K
LOCK INDICATOR
SYMBOL TIMING ERROR

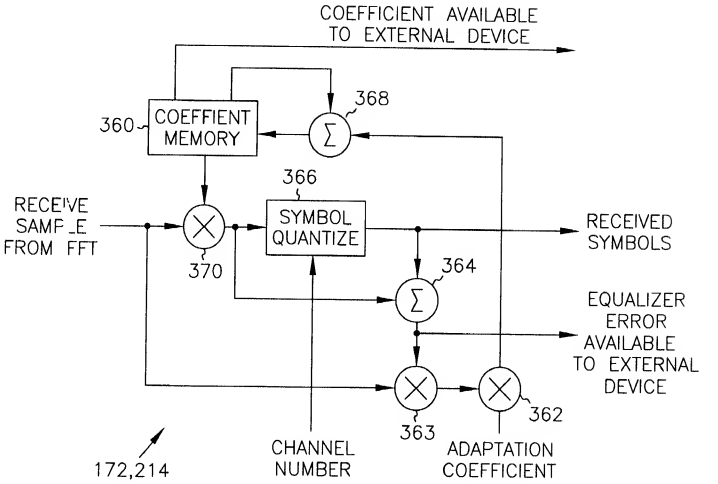

COEFFICIENT AVAILABLE
TO EXTERNAL DEVICE
368
360
COEFFIENT
MEMORY
366
RECEIVE
SAMPLE
FROM FFT
SYMBOL
QUANTIZE
RECEIVED
SYMBOLS
370
364
EQUALIZER
ERROR
AVAILABLE
TO EXTERNAL
DEVICE
362
363
172,214
CHANNEL
NUMBER
ADAPTATION
COEFFICIENT

FIG. 35

09960820 "HZETO660

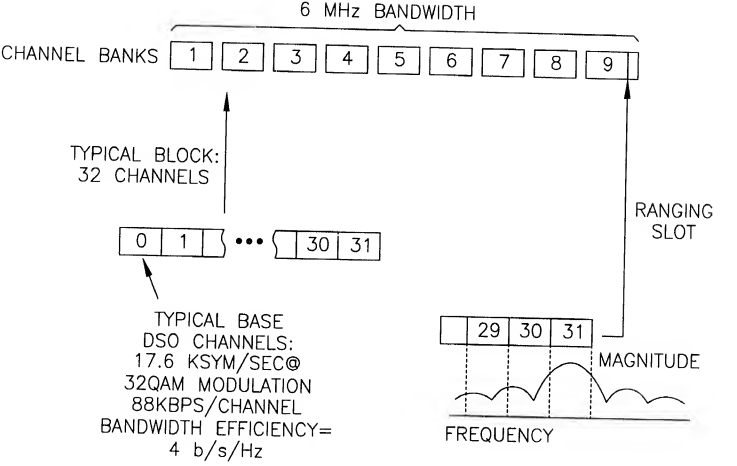


FIG. 36

TO6020 "627D660

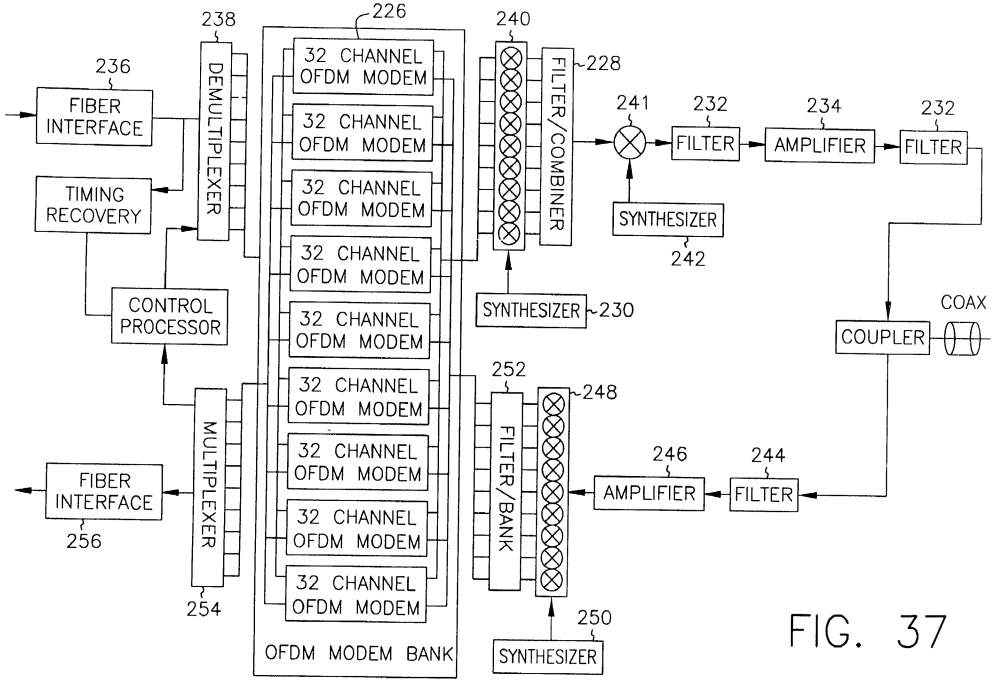


FIG. 37

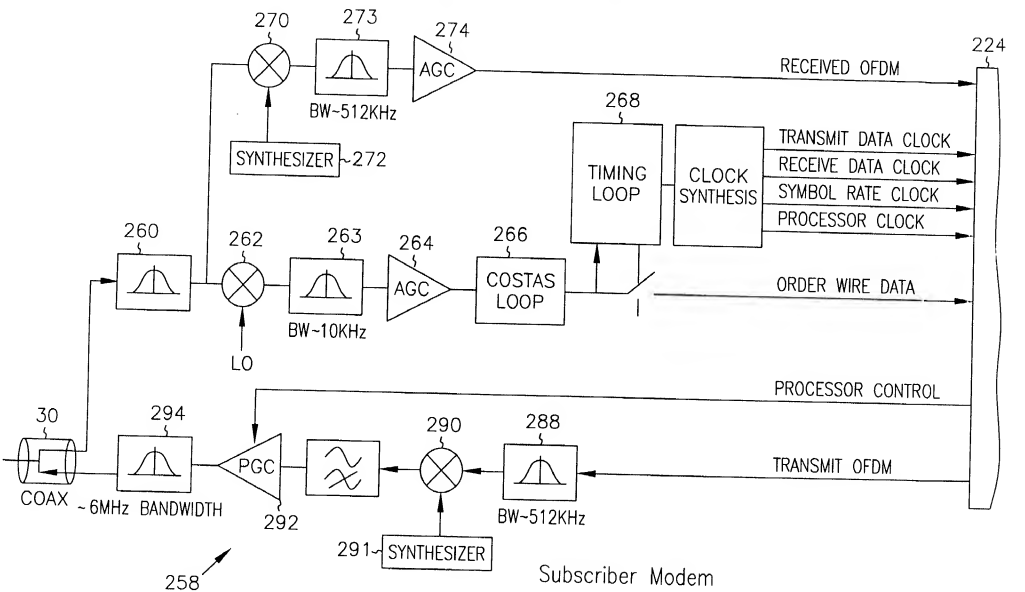

270
273
274
AGC
BW~512KHz
RECEIVED OFDM
224
SYNTHESIZER
272
268
TIMING LOOP
CLOCK SYNTHESIS
TRANSMIT DATA CLOCK
RECEIVE DATA CLOCK
SYMBOL RATE CLOCK
PROCESSOR CLOCK
260
262
263
264
266
AGC
COSTAS LOOP
ORDER WIRE DATA
BW~10KHz
LO
PROCESSOR CONTROL
30
294
290
288
PGC
TRANSMIT OFDM
COAX
~6MHz BANDWIDTH
292
BW~512KHz
291
SYNTHESIZER
258
Subscriber Modem

FIG. 38

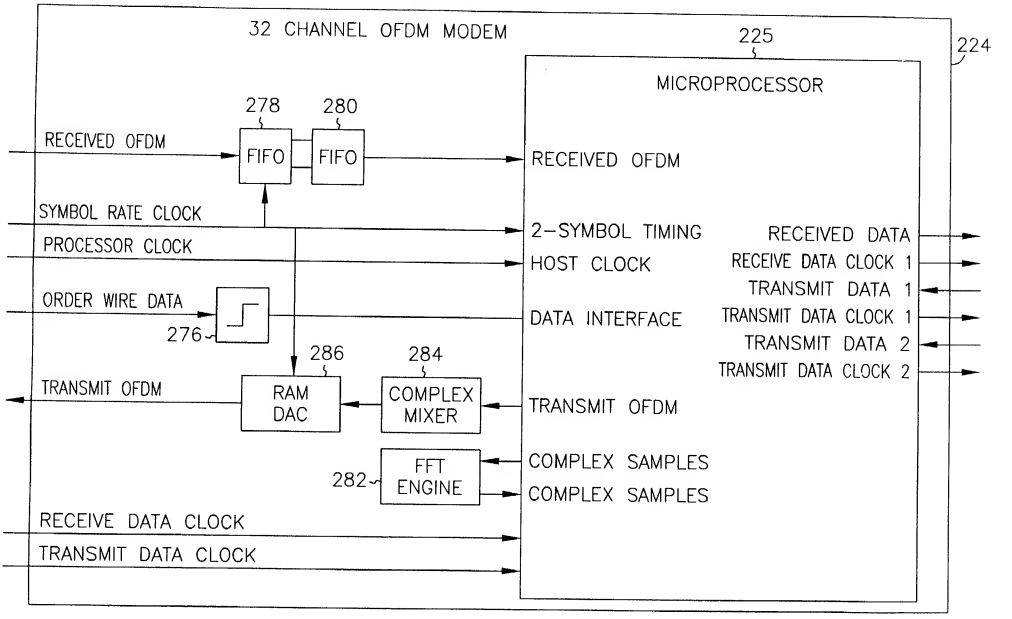

32 CHANNEL OFDM MODEM
225
224
MICROPROCESSOR
278
280
RECEIVED OFDM
FIFO
FIFO
RECEIVED OFDM
SYMBOL RATE CLOCK
2-SYMBOL TIMING
RECEIVED DATA
PROCESSOR CLOCK
HOST CLOCK
RECEIVE DATA CLOCK 1
TRANSMIT DATA 1
ORDER WIRE DATA
276
DATA INTERFACE
TRANSMIT DATA CLOCK 1
TRANSMIT DATA 2
TRANSMIT DATA CLOCK 2
286
284
TRANSMIT OFDM
RAM DAC
COMPLEX MIXER
TRANSMIT OFDM
282
FFT ENGINE
COMPLEX SAMPLES
COMPLEX SAMPLES
RECEIVE DATA CLOCK
TRANSMIT DATA CLOCK

FIG. 39

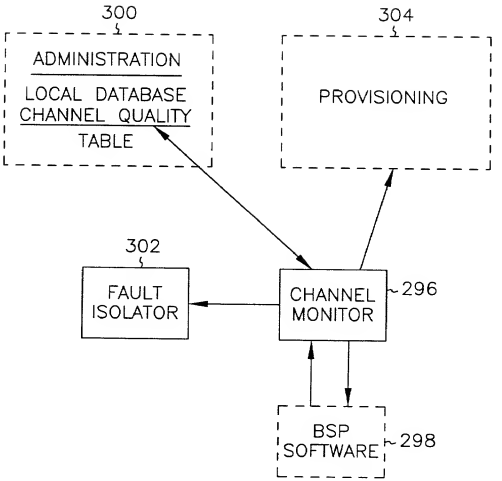

300
ADMINISTRATION
LOCAL DATABASE
CHANNEL QUALITY
TABLE
304
PROVISIONING
302
FAULT
ISOLATOR
CHANNEL
MONITOR
296
BSP
SOFTWARE
298

FIG. 40

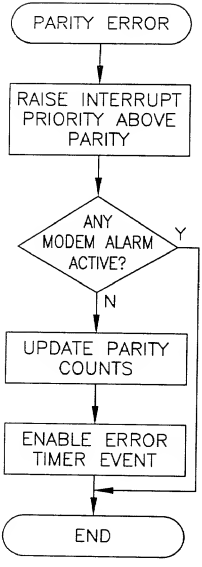


FIG. 41

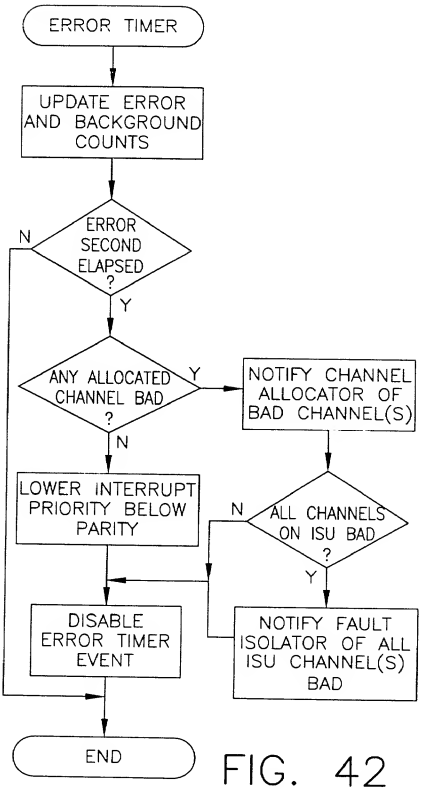


FIG. 42

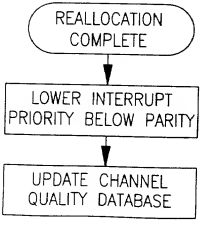
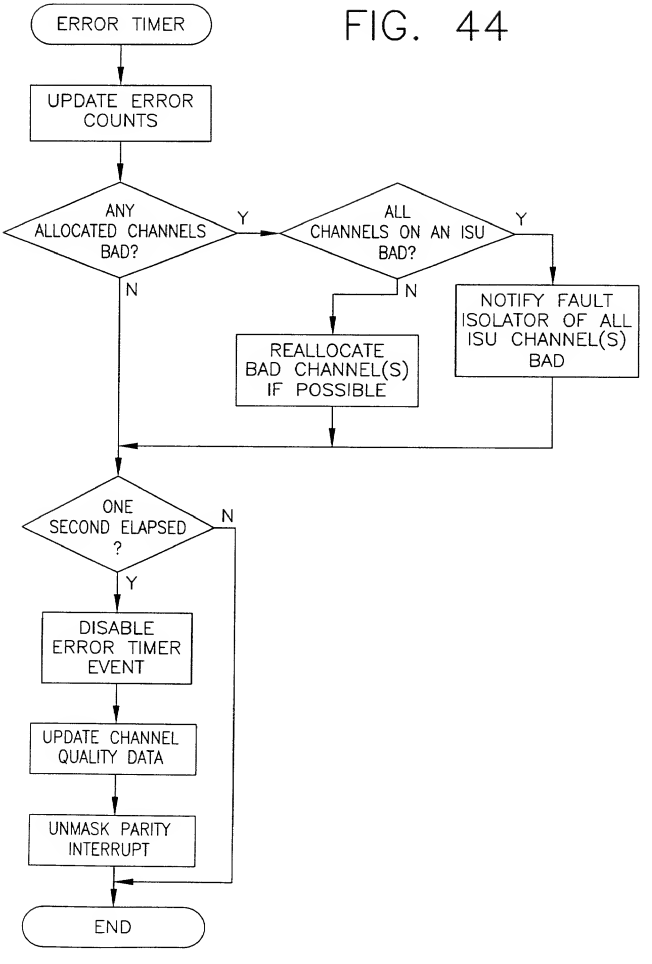


FIG. 43

FIG. 44


ERROR TIMER
UPDATE ERROR COUNTS
ANY ALLOCATED CHANNELS BAD?
Y
ALL CHANNELS ON AN ISU BAD?
Y
N
N
NOTIFY FAULT ISOLATOR OF ALL ISU CHANNEL(S) BAD
REALLOCATE BAD CHANNEL(S) IF POSSIBLE
ONE SECOND ELAPSED ?
N
Y
DISABLE ERROR TIMER EVENT
UPDATE CHANNEL QUALITY DATA
UNMASK PARITY INTERRUPT
END

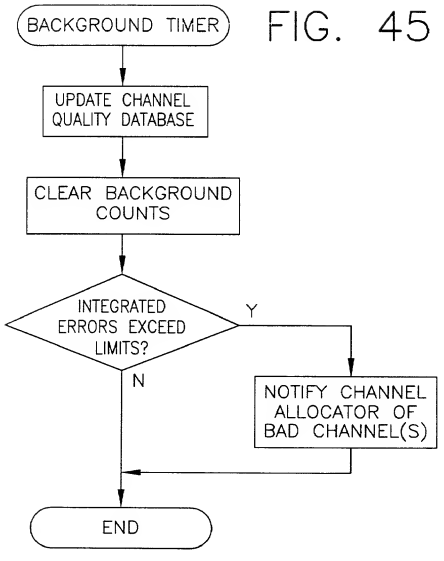

BACKGROUND TIMER
UPDATE CHANNEL QUALITY DATABASE
CLEAR BACKGROUND COUNTS
INTEGRATED ERRORS EXCEED LIMITS?
Y
N
NOTIFY CHANNEL ALLOCATOR OF BAD CHANNEL(S)
END

FIG. 45

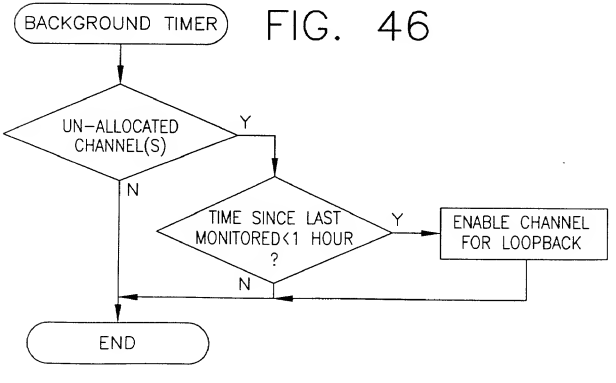

BACKGROUND TIMER
UN-ALLOCATED CHANNEL(S)
Y
N
TIME SINCE LAST MONITORED<1 HOUR ?
Y
N
ENABLE CHANNEL FOR LOOPBACK
END

FIG. 46

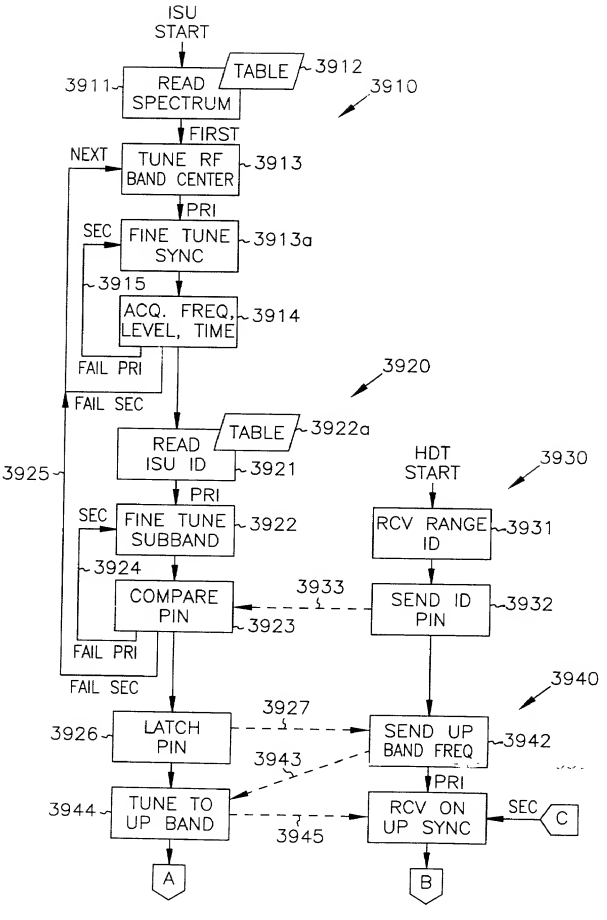

ISU START
READ SPECTRUM
TABLE
3911
3912
3910
FIRST
NEXT
TUNE RF BAND CENTER
3913
PRI
SEC
FINE TUNE SYNC
3913a
3915
ACQ. FREQ, LEVEL, TIME
3914
FAIL PRI
FAIL SEC
3920
READ ISU ID
TABLE
3922a
3921
3925
PRI
SEC
FINE TUNE SUBBAND
3922
3924
COMPARE PIN
3923
FAIL PRI
FAIL SEC
HDT START
3930
RCV RANGE ID
3931
SEND ID PIN
3932
3933
3940
LATCH PIN
3926
3927
SEND UP BAND FREQ
3942
3943
PRI
TUNE TO UP BAND
3944
3945
RCV ON UP SYNC
SEC
C
A
B

FIG. 47

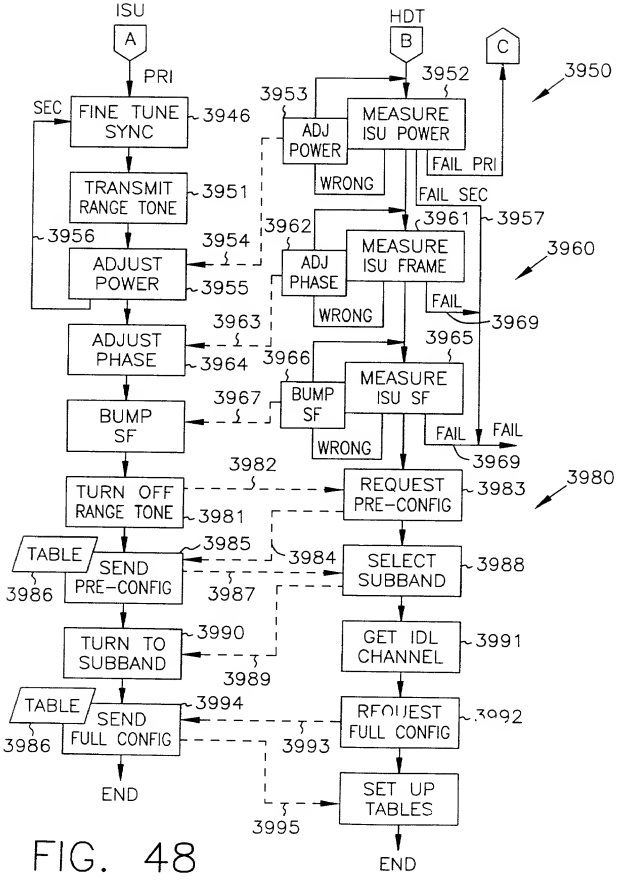

ISU
A
PRI
SEC
FINE TUNE SYNC
3946
TRANSMIT RANGE TONE
3951
3956
ADJUST POWER
3955
3954
ADJUST PHASE
3964
3963
BUMP SF
3967
TURN OFF RANGE TONE
3981
TABLE
SEND PRE-CONFIG
3986
3985
TURN TO SUBBAND
3990
3989
TABLE
SEND FULL CONFIG
3986
3994
END
HDT
B
C
3950
3952
3953
MEASURE ISU POWER
ADJ POWER
WRONG
FAIL PRI
FAIL SEC
3961
3957
3962
MEASURE ISU FRAME
ADJ PHASE
3960
WRONG
FAIL
3969
3965
3966
MEASURE ISU SF
BUMP SF
WRONG
FAIL
FAIL
3969
3982
REQUEST PRE-CONFIG
3983
3980
3984
SELECT SUBBAND
3988
3987
GET IDL CHANNEL
3991
REQUEST FULL CONFIG
3992
3993
SET UP TABLES
3995
END

FIG. 48

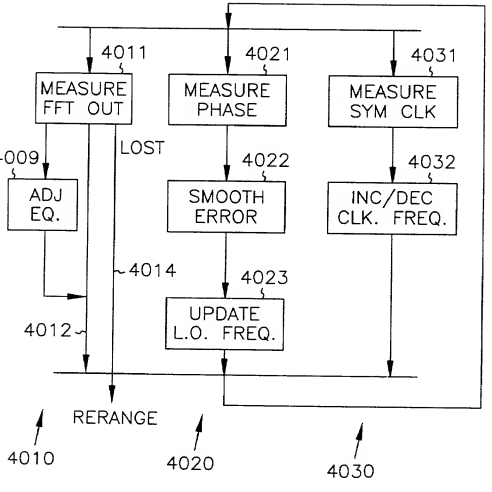

4011
4021
4031
MEASURE FFT OUT
MEASURE PHASE
MEASURE SYM CLK
4009
LOST
4022
4032
ADJ EQ.
SMOOTH ERROR
INC/DEC CLK. FREQ.
4014
4023
4012
UPDATE L.O. FREQ.
RERANGE
4010
4020
4030

FIG. 49

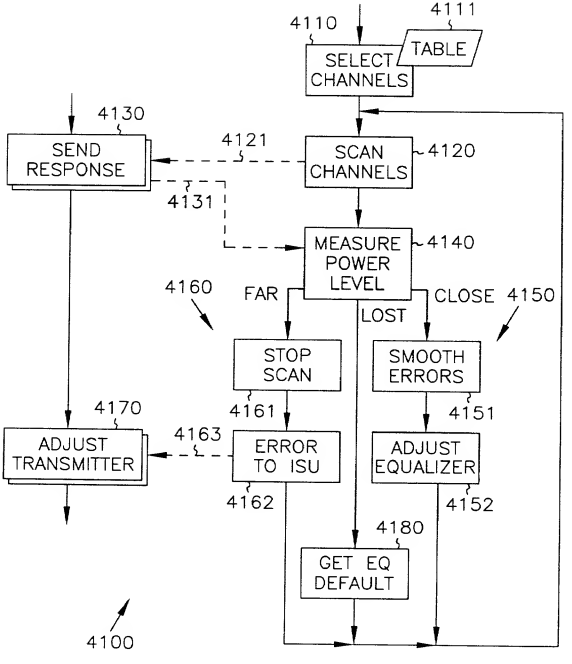

4110
4111
TABLE
SELECT CHANNELS
4130
SEND RESPONSE
4121
SCAN CHANNELS
4120
4131
MEASURE POWER LEVEL
4140
4160
FAR
CLOSE
4150
LOST
STOP SCAN
SMOOTH ERRORS
4161
4151
4170
4163
ADJUST TRANSMITTER
ERROR TO ISU
ADJUST EQUALIZER
4162
4152
4180
GET EQ DEFAULT
4100

FIG. 50

T06020 "h/ET0660

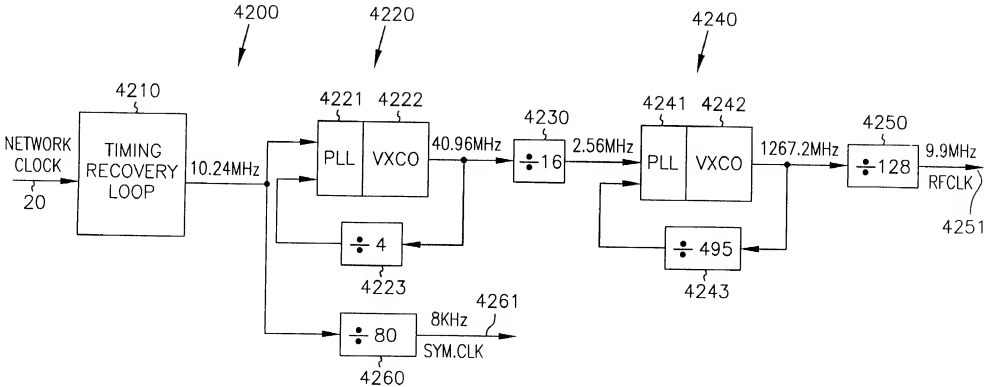


FIG. 51

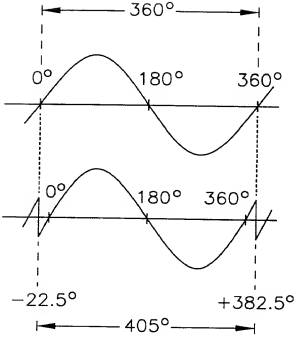

360°
0°
180°
360°
0°
180°
360°
−22.5°
+382.5°
405°

FIG. 52

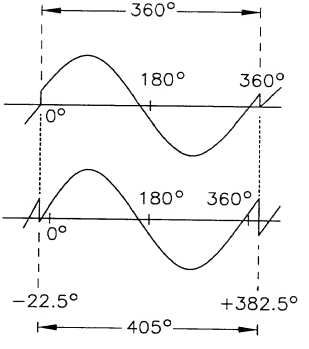

360°
180°
360°
0°
180°
360°
0°
−22.5°
+382.5°
405°

FIG. 53

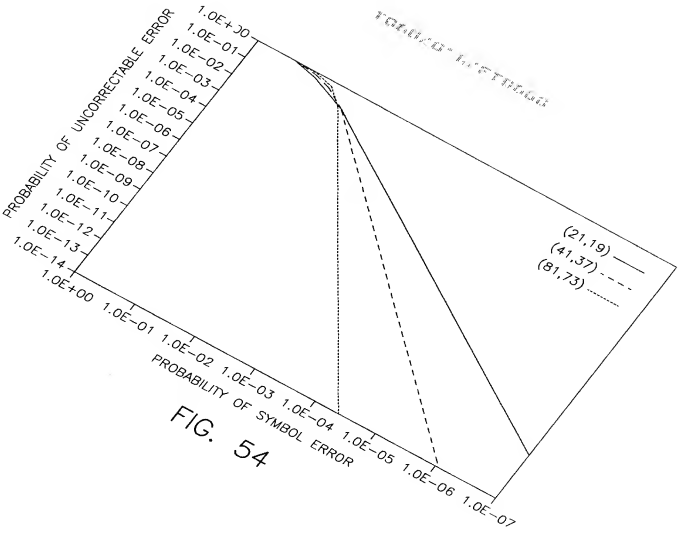

PROBABILITY OF UNCORRECTABLE ERROR
1.0E+00
1.0E−01
1.0E−02
1.0E−03
1.0E−04
1.0E−05
1.0E−06
1.0E−07
1.0E−08
1.0E−09
1.0E−10
1.0E−11
1.0E−12
1.0E−13
1.0E−14
1.0E+00 1.0E−01 1.0E−02 1.0E−03 1.0E−04 1.0E−05 1.0E−06 1.0E−07
PROBABILITY OF SYMBOL ERROR
(21,19)
(41,37)
(81,73)

FIG. 54

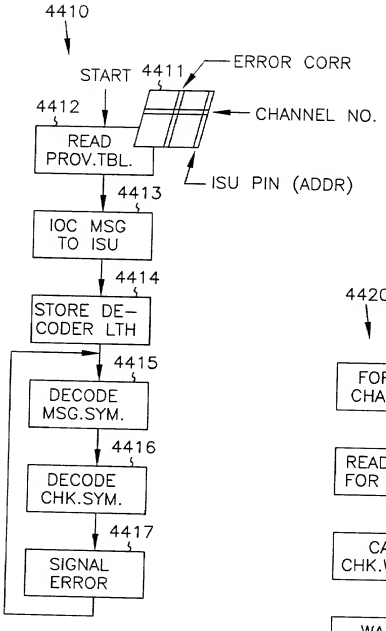

4410
START
4411
ERROR CORR
4412
CHANNEL NO.
READ PROV.TBL.
ISU PIN (ADDR)
4413
IOC MSG TO ISU
4414
STORE DE-CODER LTH
4415
DECODE MSG.SYM.
4416
DECODE CHK.SYM.
4417
SIGNAL ERROR

FIG. 55

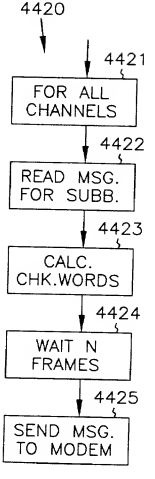

4420
4421
FOR ALL CHANNELS
4422
READ MSG. FOR SUBB.
4423
CALC. CHK.WORDS
4424
WAIT N FRAMES
4425
SEND MSG. TO MODEM

FIG. 56

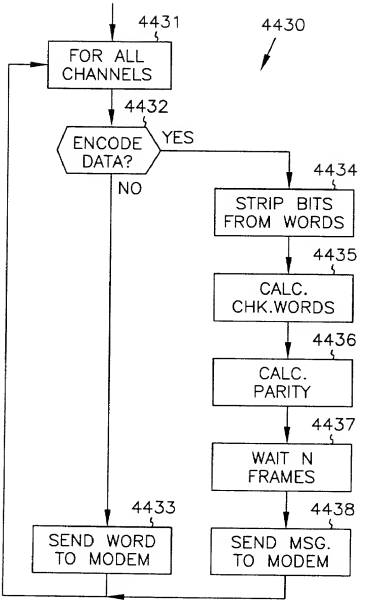

4431
4430
FOR ALL CHANNELS
4432
ENCODE DATA?
YES
NO
4434
STRIP BITS FROM WORDS
4435
CALC. CHK.WORDS
4436
CALC. PARITY
4437
WAIT N FRAMES
4433
SEND WORD TO MODEM
4438
SEND MSG. TO MODEM

FIG. 57

Docket No. 2ET0866

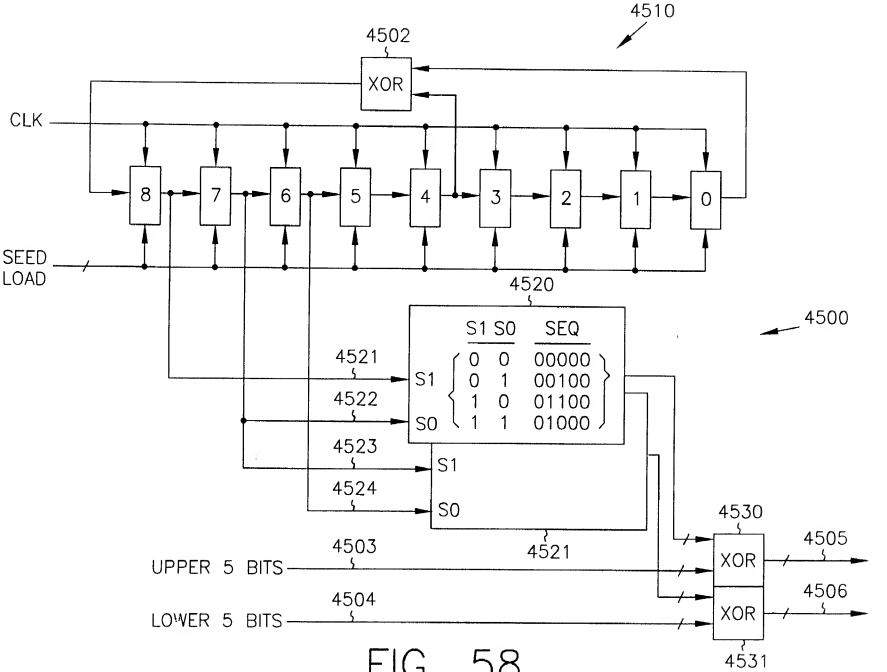


FIG. 58

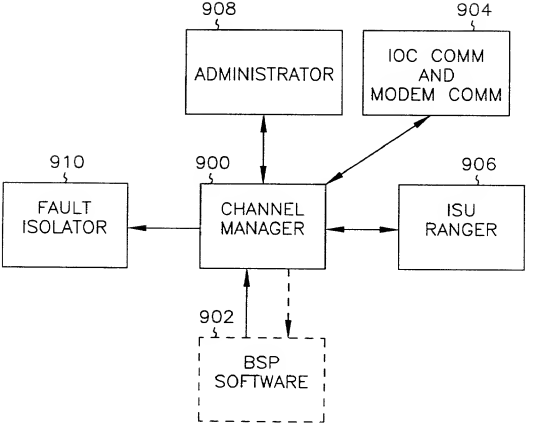

908
ADMINISTRATOR
904
IOC COMM AND MODEM COMM
910
FAULT ISOLATOR
900
CHANNEL MANAGER
906
ISU RANGER
902
BSP SOFTWARE

FIG. 59

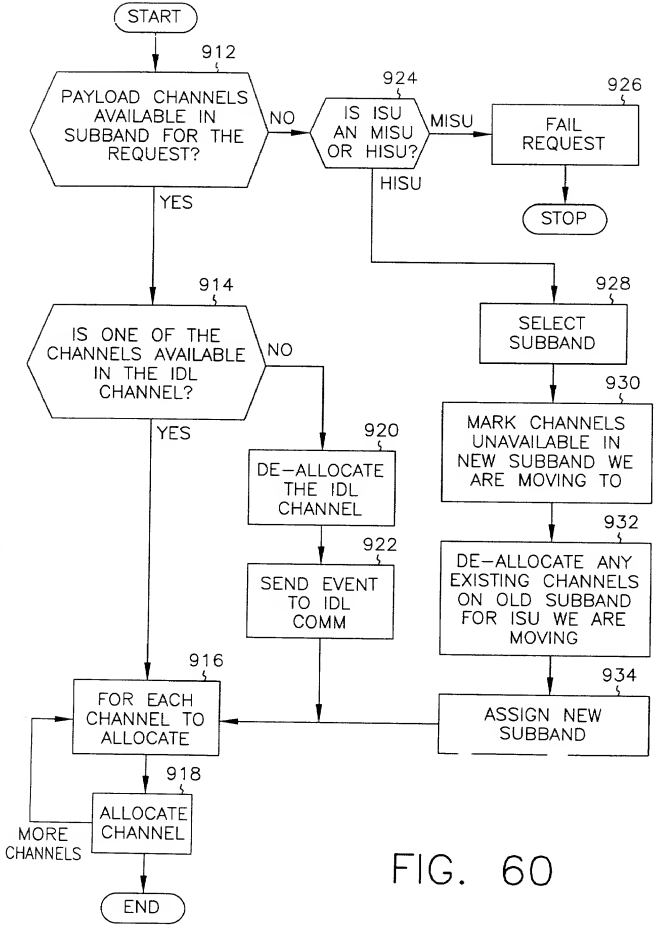

START
912
PAYLOAD CHANNELS AVAILABLE IN SUBBAND FOR THE REQUEST?
NO
924
IS ISU AN MISU OR HISU?
MISU
926
FAIL REQUEST
STOP
HISU
YES
914
IS ONE OF THE CHANNELS AVAILABLE IN THE IDL CHANNEL?
NO
YES
920
DE-ALLOCATE THE IDL CHANNEL
922
SEND EVENT TO IDL COMM
928
SELECT SUBBAND
930
MARK CHANNELS UNAVAILABLE IN NEW SUBBAND WE ARE MOVING TO
932
DE-ALLOCATE ANY EXISTING CHANNELS ON OLD SUBBAND FOR ISU WE ARE MOVING
934
ASSIGN NEW SUBBAND
916
FOR EACH CHANNEL TO ALLOCATE
918
ALLOCATE CHANNEL
MORE CHANNELS
END

FIG. 60

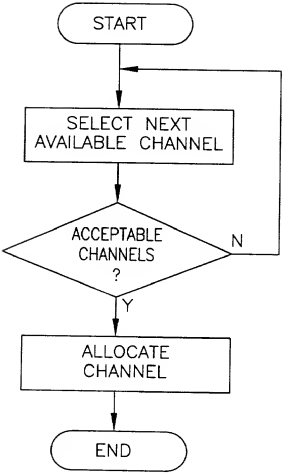

START
SELECT NEXT AVAILABLE CHANNEL
ACCEPTABLE CHANNELS ?
N
Y
ALLOCATE CHANNEL
END

FIG. 61

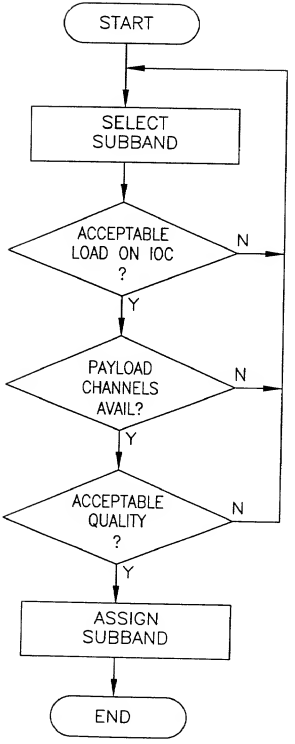

START
SELECT SUBBAND
ACCEPTABLE LOAD ON IOC ?
N
Y
PAYLOAD CHANNELS AVAIL?
N
Y
ACCEPTABLE QUALITY ?
N
Y
ASSIGN SUBBAND
END

FIG. 62

T0660 "1271660

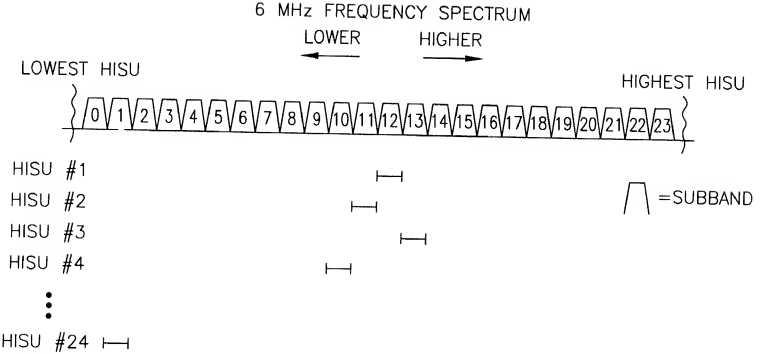


FIG. 63

D0602 "42010660

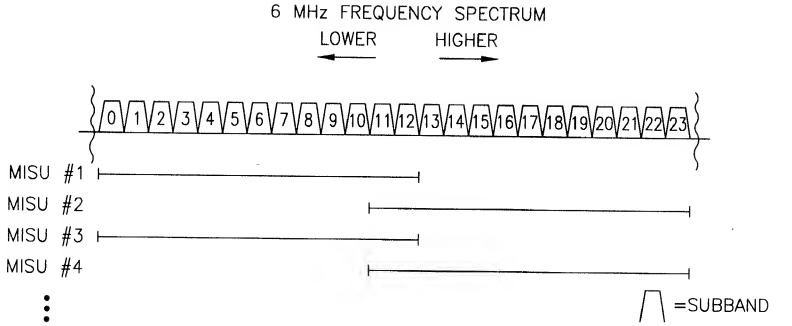


FIG. 64

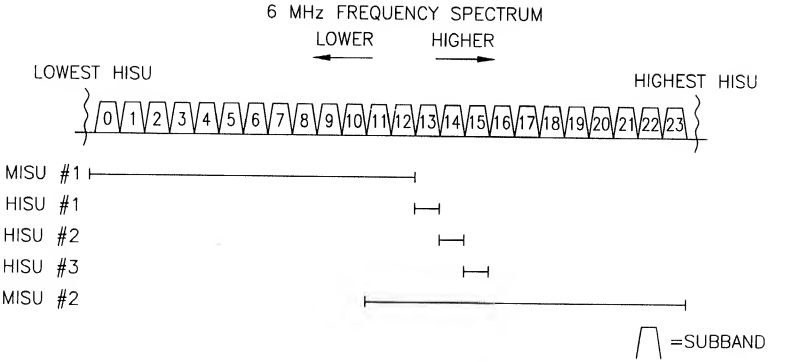

6 MHz FREQUENCY SPECTRUM
LOWER
HIGHER
LOWEST HISU
HIGHEST HISU
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
MISU #1
HISU #1
HISU #2
HISU #3
MISU #2
=SUBBAND

FIG. 65

T06020 "4270660

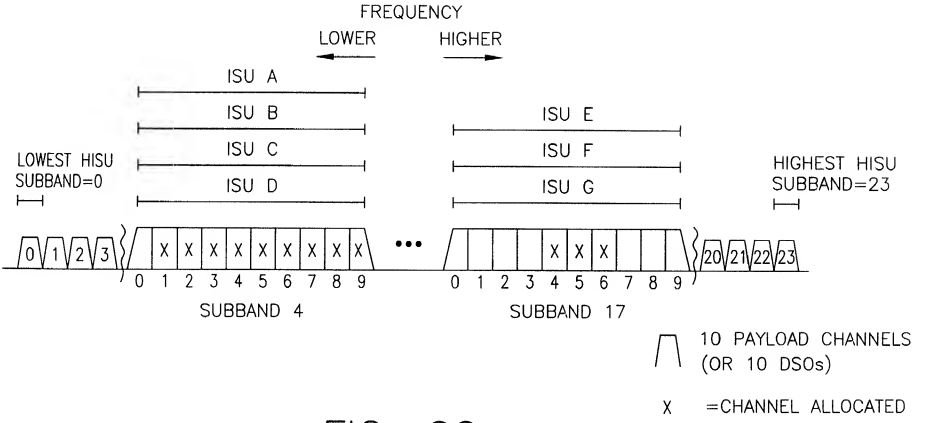


FIG. 66

T06020 "4/2T0666

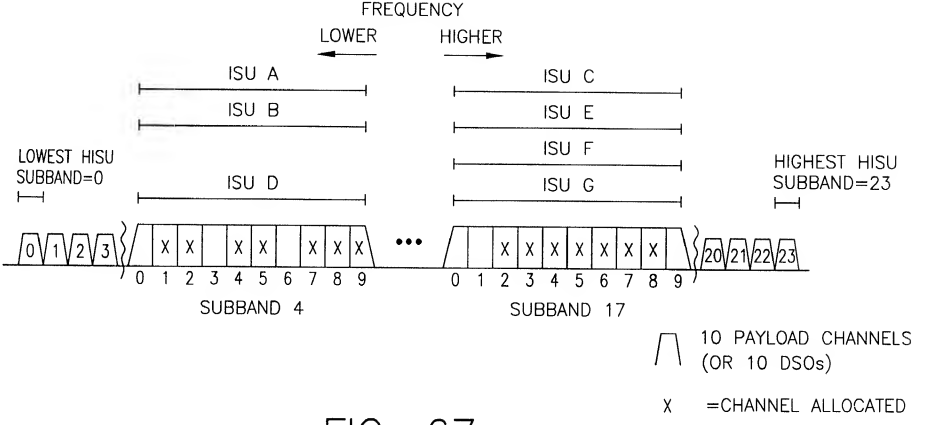


FIG. 67

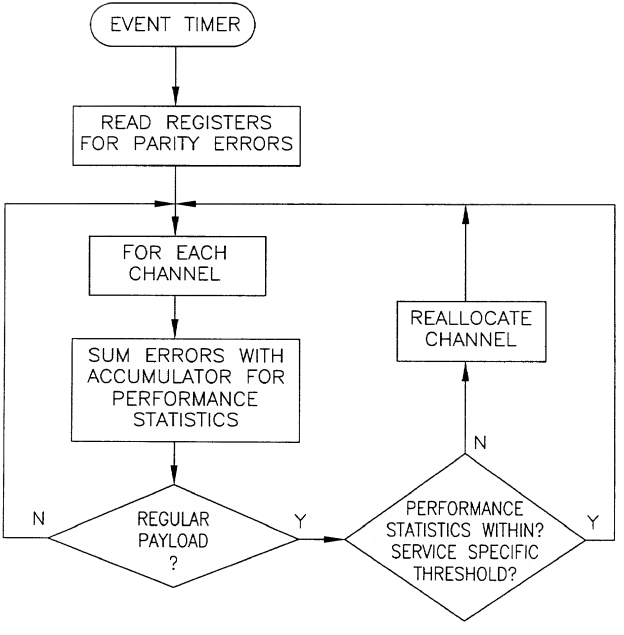

EVENT TIMER
READ REGISTERS FOR PARITY ERRORS
FOR EACH CHANNEL
SUM ERRORS WITH ACCUMULATOR FOR PERFORMANCE STATISTICS
REGULAR PAYLOAD ?
N
Y
PERFORMANCE STATISTICS WITHIN? SERVICE SPECIFIC THRESHOLD?
N
Y
REALLOCATE CHANNEL

FIG. 68

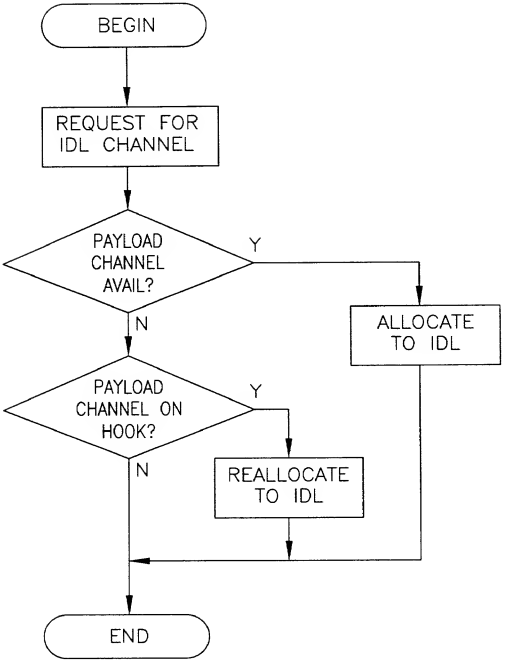

BEGIN
REQUEST FOR IDL CHANNEL
PAYLOAD CHANNEL AVAIL?
Y
N
ALLOCATE TO IDL
PAYLOAD CHANNEL ON HOOK?
Y
N
REALLOCATE TO IDL
END

FIG. 69

TOSOZO"NZETOSSO

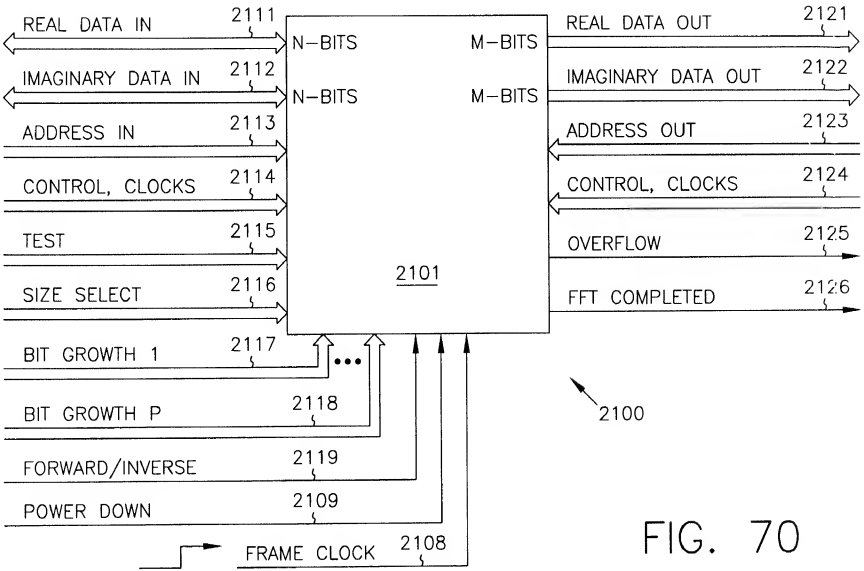


FIG. 70

TGGDZ0 "HZETOGGG

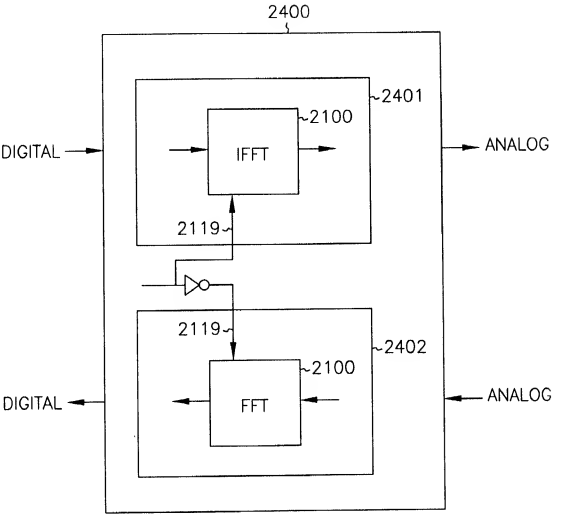


FIG. 71

TOSOZO "ATZETOSOO

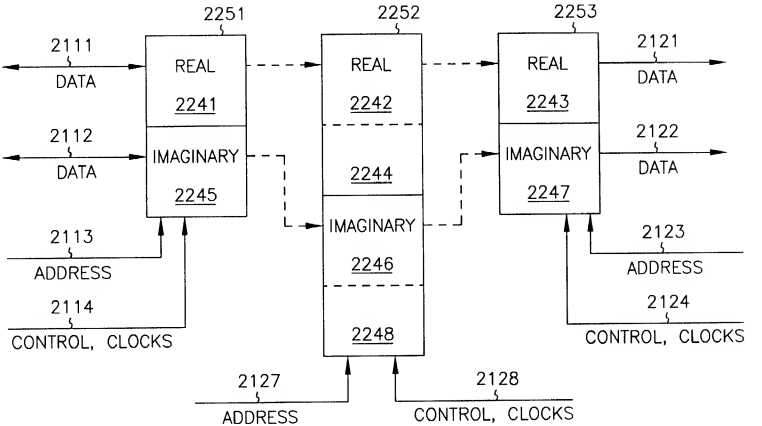


FIG. 72

TOSCO1 H2ETOSSO

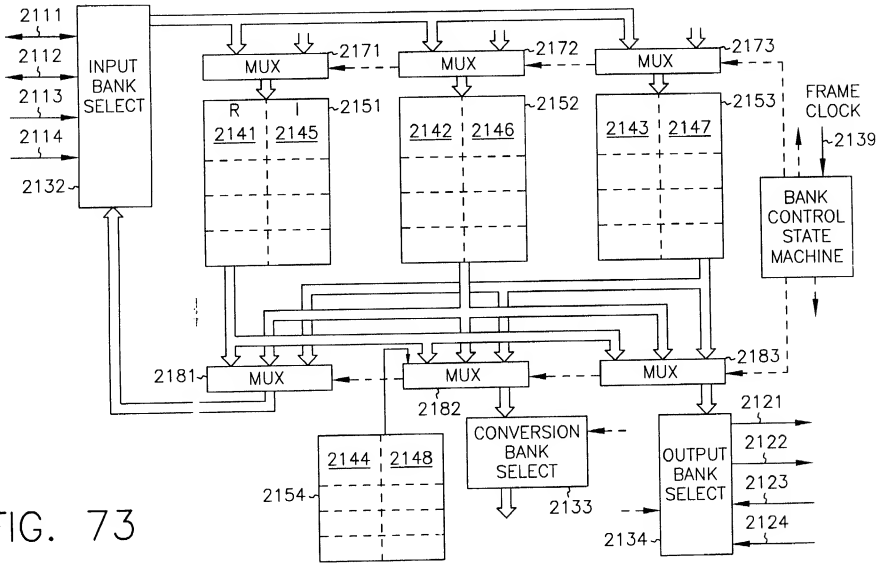
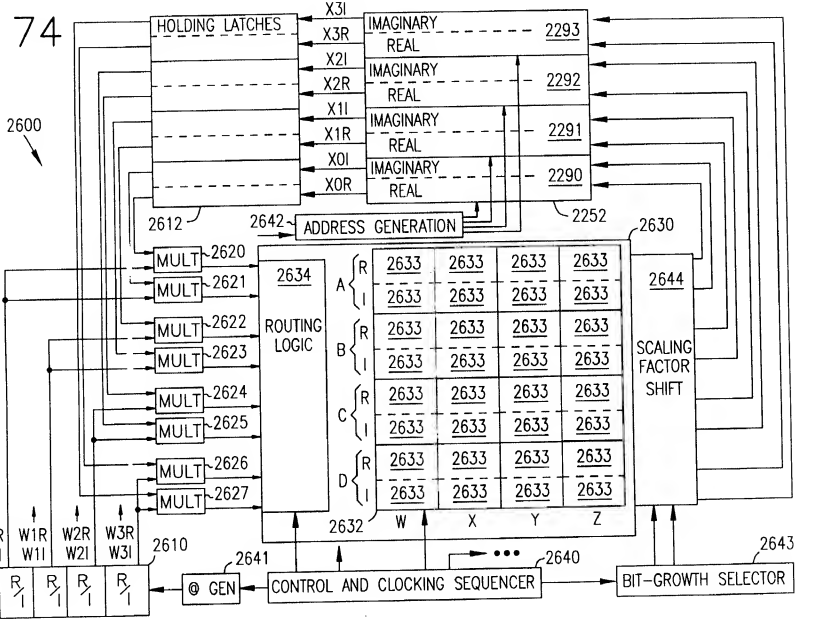


FIG. 73

FIG. 74


2600
HOLDING LATCHES
X3I
X3R
X2I
X2R
X1I
X1R
X0I
X0R
IMAGINARY
REAL
2293
2292
2291
2290
2252
2612
2642
ADDRESS GENERATION
2630
MULT 2620
MULT 2621
MULT 2622
MULT 2623
MULT 2624
MULT 2625
MULT 2626
MULT 2627
2634
ROUTING LOGIC
A
B
C
D
R
I
2633
2644
SCALING FACTOR SHIFT
2632
W
X
Y
Z
WOR
WOI
W1R
W1I
W2R
W2I
W3R
W3I
2610
R/I
@ GEN
2641
CONTROL AND CLOCKING SEQUENCER
2640
BIT-GROWTH SELECTOR
2643

THIS TABLE SHOWS THE ORDER OF CALCULATION FOR A TRANSPOSED BUTTERFLY:

C0

AWR=WR AWI =WI	AXR =XR AXI =XI	AYR =YR AYI =YI	AZR =ZR AZI =ZI
BWR=WR BWI =WI	BXR=XR BXI =XI	BYR=YR BYI =YI	BZR=ZR BZI =ZI
CWR=WR CWI =WI	CXR=XR CXI =XI	CYR=YR CYI =YI	CZR=ZR CZI =ZI
DWR =WR DWI =WI	DXR=XR DXI =XI	DYR=YR DYI =YI	DZR=ZR DZI =ZI

2632

2800

FIG. 75

CI

AWR=AWR −WI AWI=AWI +WR	AXR=AXR −XI AXI=AXI +XR	AYR=AYR −YI AYI=AYI +YR	AZR=AZR −ZI AZI=AZI +ZR
BWR=BWR−WI BWI=BWI +WR	BXR=BXR −XI BXI=BXI +XR	BYR=BYR −YI BYI=BYI +YR	BZR=BZR −ZI BZI=BZI +ZR
CWR=CWR−WI CWI=CWI +WR	CXR=CXR −XI CXI=CXI +XR	CYR=CYR −YI CYI=CYI +YR	CZR=CZR −ZI CZI=CZI +ZR
DWR=DWR−WI DWI=DWI +WR	DXR=DXR −XI DXI=DXI +XR	DYR=DYR −YI DYI=DYI +YR	DZR=DZR −ZI DZI=DZI +ZR

2632

2800

FIG. 76

C2

AWR=AWR +WR AWI=AWI +WI	AXR=AXR +XI AXI=AXI −XR	AYR=AYR −YR AYI=AYI −YI	AZR=AZR −ZI AZI=AZI +ZR
BWR=BWR+WR BWI=BWI +WI	BXR=BXR +XI BXI=BXI −XR	BYR=BYR −YR BYI=BYI −YI	BZR=BZR −ZI BZI=BZI +ZR
CWR=CWR+WR CWI=CWI +WI	CXR=CXR +XI CXI=CXI −XR	CYR=CYR −YR CYI=CYI −YI	CZR=CZR −ZI CZI=CZI +ZR
DWR=DWR+WR DWI=DWI +WI	DXR=DXR +XI DXI=DXI −XR	DYR=DYR −YR DYI=DYI −YI	DZR=DZR −ZI DZI=DZI +ZR

2632

2800

FIG. 77

C3

AWR=AWR −WI AWI=AWI +WR	AXR=AXR +XR AXI=AXI +XI	AYR=AYR +YI AYI=AYI −YR	AZR=AZR −ZR AZI=AZI −ZI
BWR=BWR−WI BWI=BWI +WR	BXR=BXR +XR BXI=BXI +XI	BYR=BYR +YI BYI=BYI −YR	BZR=BZR −ZR BZI=BZI −ZI
CWR=CWR−WI CWI=CWI +WR	CXR=CXR +XR CXI=CXI +XI	CYR=CYR +YI CYI=CYI −YR	CZR=CZR −ZR CZI=CZI −ZI
DWR=DWR−WI DWI=DWI +WR	DXR=DXR +XR DXI=DXI +XI	DYR=DYR +YI DYI=DYI −YR	DZR=DZR −ZR DZI=DZI −ZI

2632

2800

FIG. 78

C4

AWR=AWR +WR AWI=AW' +WI	AXR=AXR --XR AXI=AXI −XI	AYR=AYR +YR AYI=AYI +YI	AZR=AZR −ZR AZI=AZI −ZI
BWR=BWR+WR BWI=BWI +WI	BXR=BXR −XR BXI=BXI −XI	BYR=BYR +YR BYI=BYI +YI	BZR=BZR −ZR BZI=BZI −ZI
CWR=CWR+WR CWI=CWI +WI	CXR=CXR −XR CXI=CXI −XI	CYR=CYR +YR CYI=CYI +YI	CZR=CZR −ZR CZI=CZI −ZI
DWR=DWR+WR DWI=DWI +WI	DXR=DXR −XR DXI=DXI −XI	DYR=DYR +YR DYI=DYI +YI	DZR=DZR −ZR DZI=DZI −ZI

2632

2800

FIG. 79

C5

AWR=AWR −WI AWI=AWI +WR	AXR=AXR +XI AXI=AXI −XR	AYR=AYR −YI AYI=AYI +YR	AZR=AZR +ZI AZI=AZI −ZR
BWR=BWR−WI BWI=BWI +WR	BXR=BXR +XI BXI=BXI −XR	BYR=BYR −YI BYI=BYI +YR	BZR=BZR +ZI BZI=BZI −ZR
CWR=CWR−WI CWI=CWI +WR	CXR=CXR +XI CXI=CXI −XR	CYR=CYR −YI CYI=CYI +YR	CZR=CZR +ZI CZI=CZI −ZR
DWR=DWR−WI DWI=DWI +WR	DXR=DXR +XI DXI=DXI −XR	DYR=DYR −YI DYI=DYI +YR	DZR=DZR +ZI DZI=DZI −ZR

2632

2800

FIG. 80

C6

AWR=AWR +WR AWI=AWI +WI	AXR=AXR −XI AXI=AXI +XR	AYR=AYR −YR AYI=AYI −YI	AZR=AZR +ZI AZI=AZI −ZR
BWR=BWR+WR BWI=BWI +WI	BXR=BXR −XI BXI=BXI +XR	BYR=BYR −YR BYI=BYI −YI	BZR=BZR +ZI BZI=BZI −ZR
CWR=CWR+WR CWI=CWI +WI	CXR=CXR −XI CXI=CXI +XR	CYR=CYR −YR CYI=CYI −YI	CZR=CZR +ZI CZI=CZI −ZR
DWR=DWR+WR DWI=DWI +WI	DXR=DXR −XI DXI=DXI +XR	DYR=DYR −YR DYI=DYI −YI	DZR=DZR +ZI DZI=DZI −ZR

2632

2800

FIG. 81

C7

AWR=AWR −WI AWI=AWI +WR	AXR=AXR −XR AXI=AXI −XI	AYR=AYR +YI AYI=AYI −YR	AZR=AZR −ZR AZI=AZI +ZI
BWR=BWR−WI BWI=BWI +WR	BXR=BXR −XR BXI=BXI −XI	BYR=BYR +YI BYI=BYI −YR	BZR=BZR −ZR BZI=BZI +ZI
CWR=CWR−WI CWI=CWI +WR	CXR=CXR −XR CXI=CXI −XI	CYR=CYR +YI CYI=CYI −YR	CZR=CZR −ZR CZI=CZI +ZI
DWR=DWR−WI DWI=DWI +WR	DXR=DXR −XR DXI=DXI −XI	DYR=DYR +YI DYI=DYI −YR	DZR=DZR −ZR DZI=DZI +ZI

2632

2800

FIG. 82

THIS TABLE SHOWS THE ORDER OF CALCULATION FOR A TRANSPOSED BUTTERFLY:

C0

2632

AWR =WR+XR+YR+ZR AWI =WI+XI+YI+ZI	AXR =WR−XI−YR+ZI AXI =WI+XR−YI−ZR	AYR =WR−XR+YR−ZR AYI =WI−XI+YI−ZI	AZR =WR+XI−YR−ZI AZI =WI−XR−YI+ZR
− −	− −	− −	− −
− −	− −	− −	− −
− −	− −	− −	− −

2810

FIG. 83

C1

2632

AWR =AWR−(WI+XI+YI+ZI) AWI =AWI+(WR+XR+YR+ZR)	AXR =AXR−(WI+XR−YI−ZR) AXI =AXI+(WR−XI−YR+ZI)	AYR =AYR−(WI−XI+YI−ZI) AYI =AYI+(WR−XR+YR−ZR)	AZR =AZR−(WI−XR−YI+ZR) AZI =AZI+(WR+XI−YR−ZI)
− −	− −	− −	− −
− −	− −	− −	− −
− −	− −	− −	− −

2810

FIG. 84

TOGO70 "HZETOGGO

2632

C2

– –	– –	– –	– –
BWR =WR+XR+YR+ZR BWI =WI+XI+YI+ZI	BXR =WR−XI−YR+ZI BXI =WI+XR−YI−ZR	BYR =WR−XR+YR−ZR BYI =WI−XI+YI−ZI	BZR =WR+XI−YR−ZI BZI =WI−XR−YI+ZR
– –	– –	– –	– –
– –	– –	– –	– –

2810

FIG. 85

2632

C3

– –	– –	– –	– –
BWR =BWR−(WI+XI+YI+ZI) BWI =BWI+(WR+XR+YR+ZR)	BXR =BXR−(WI+XR−YI−ZR) BXI =BXI+(WR−XI−YR+ZI)	BYR =BYR−(WI−XI+YI−ZI) BYI =BYI+(WR−XR+YR−ZR)	BZR =BZR−(WI−XR−YI+ZR) BZI =BZI+(WR+XI−YR−ZI)
– –	– –	– –	– –
– –	– –	– –	– –

2810

FIG. 86

C4

2632

–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
CWR =WR+XR+YR+ZR CWI =WI+XI+YI+ZI	CXR =WR−XI−YR+ZI CXI =WI+XR−YI−ZR	CYR =WR−XR+YR−ZR CYI =WI−XI+YI−ZI	CZR =WR+XI−YR−ZI CZI =WI−XR−YI+ZR
–	–	–	–
–	–	–	–

2810

FIG. 87

C5

2632

–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
CWR =CWR−(WI+XI+YI+ZI) CWI =CWI+(WR+XR+YR+ZR)	CXR =CXR−(WI+XR−YI−ZR) CXI =CXI+(WR−XI−YR+ZI)	CYR =CYR−(WI−XI+YI−ZI) CYI =CYI+(WR−XR+YR−ZR)	CZR =CZR−(WI−XR−YI+ZR) CZI =CZI+(WR+XI−YR−ZI)
–	–	–	–
–	–	–	–

2810

FIG. 88

C6

2632

2810

– –	– –	– –	– –
– –	– –	– –	– –
– –	– –	– –	– –
DWR =WR+XR+YR+ZR DWI =WI+XI+YI+ZI	DXR =WR−XI−YR+ZI DXI =WI+XR−YI−ZR	DYR =WR−XR+YR−ZR DYI =WI−XI+YI−ZI	DZR =WR+XI−YR−ZI DZI =WI−XR−YI+ZR

FIG. 89

C7

2632

2810

– –	– –	– –	– –
– –	– –	– –	– –
– –	– –	– –	– –
DWR =DWR−(WI+XI+YI+ZI) DWI =DWI+(WR+XR+YR+ZR)	DXR =DXR−(WI+XR−YI−ZR) DXI =DXI+(WR−XI−YR+ZI)	DYR =DYR−(WI−XI+YI−ZI) DYI =DYI+(WR−XR+YR−ZR)	DZR =DZR−(WI−XR−YI+ZR) DZI =DZI+(WR+XI−YR−ZI)

FIG. 90

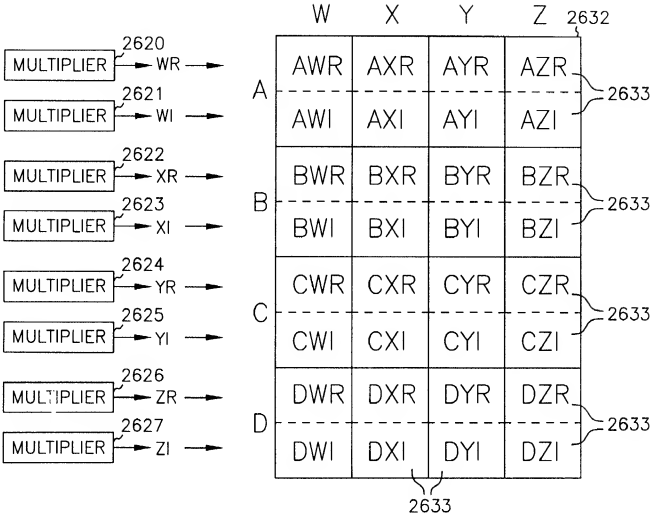

MULTIPLIER
2620
WR
MULTIPLIER
2621
WI
MULTIPLIER
2622
XR
MULTIPLIER
2623
XI
MULTIPLIER
2624
YR
MULTIPLIER
2625
YI
MULTIPLIER
2626
ZR
MULTIPLIER
2627
ZI
W
X
Y
Z
2632
A
B
C
D
AWR
AXR
AYR
AZR
AWI
AXI
AYI
AZI
BWR
BXR
BYR
BZR
BWI
BXI
BYI
BZI
CWR
CXR
CYR
CZR
CWI
CXI
CYI
CZI
DWR
DXR
DYR
DZR
DWI
DXI
DYI
DZI
2633
2633
2633
2633
2633

FIG. 91

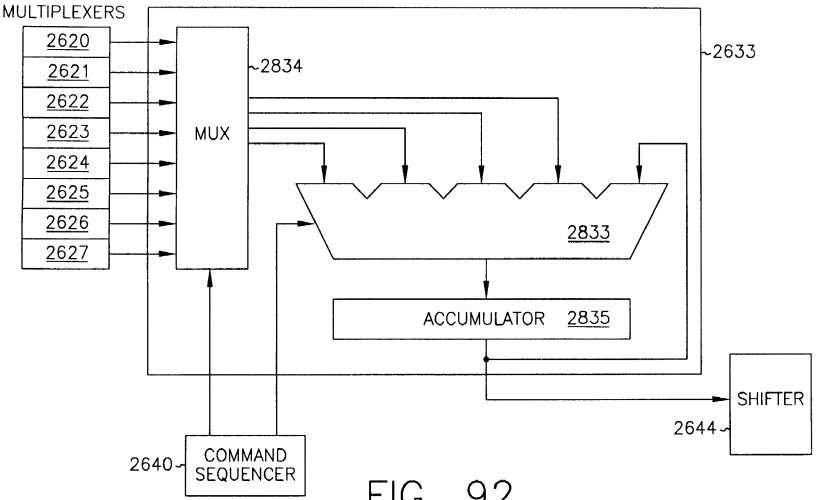

MULTIPLEXERS
2620
2621
2622
2623
2624
2625
2626
2627
MUX
2834
2633
2833
ACCUMULATOR 2835
SHIFTER
2644
2640
COMMAND SEQUENCER

FIG. 92

TD60/0 "/ET0660

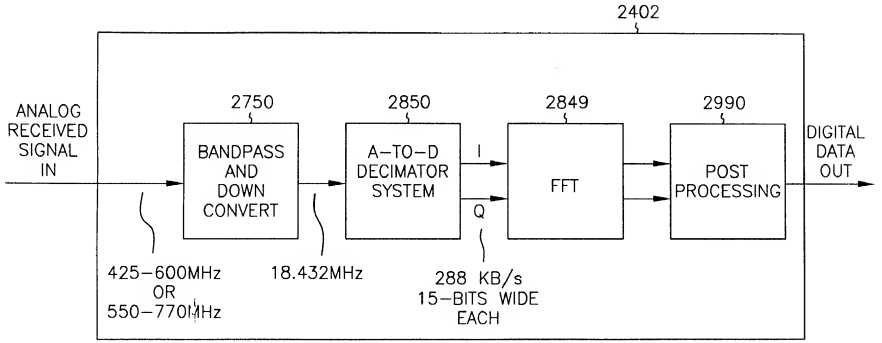


FIG. 93

EP 0 660 620 A2 EP 0 660 620 A3

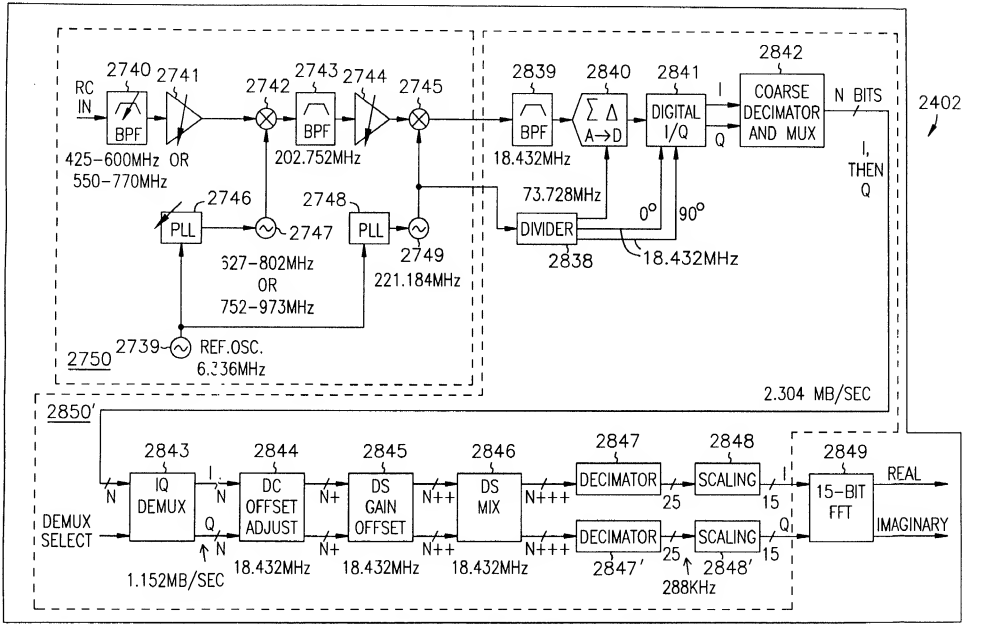


FIG. 94

TOSHIBA - EXHIBIT 1060

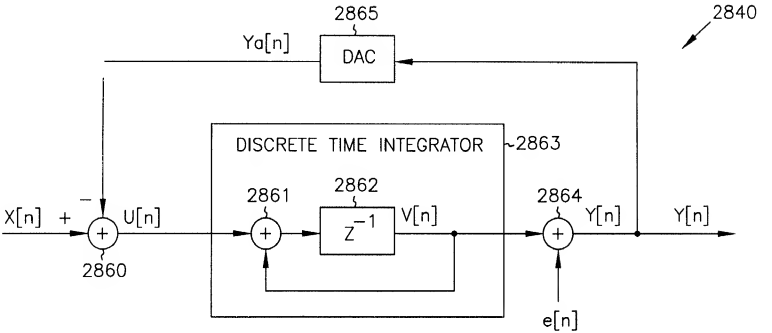


FIG. 95

D6620 '42E0660

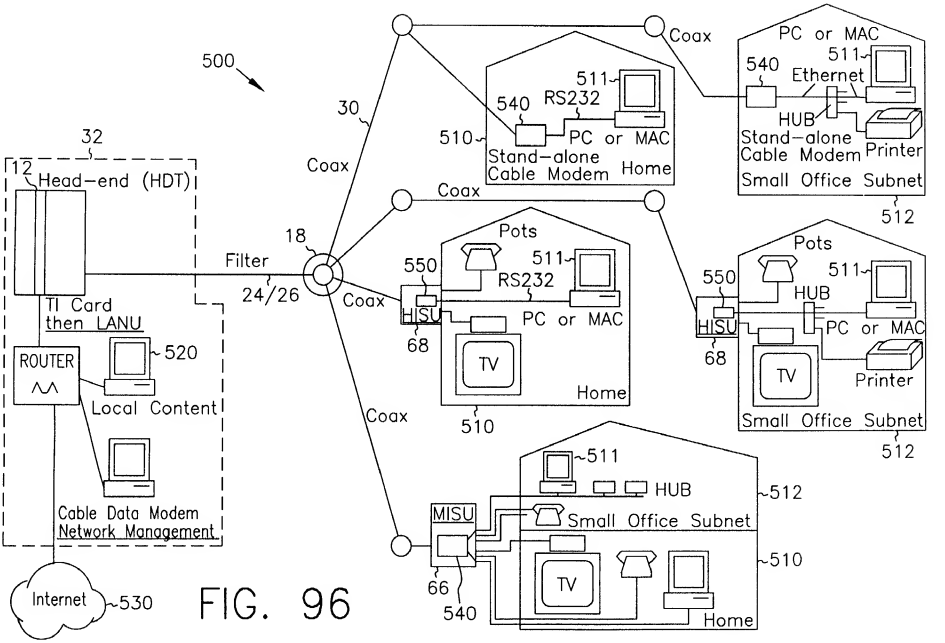


FIG. 96

TD60203-US2570660

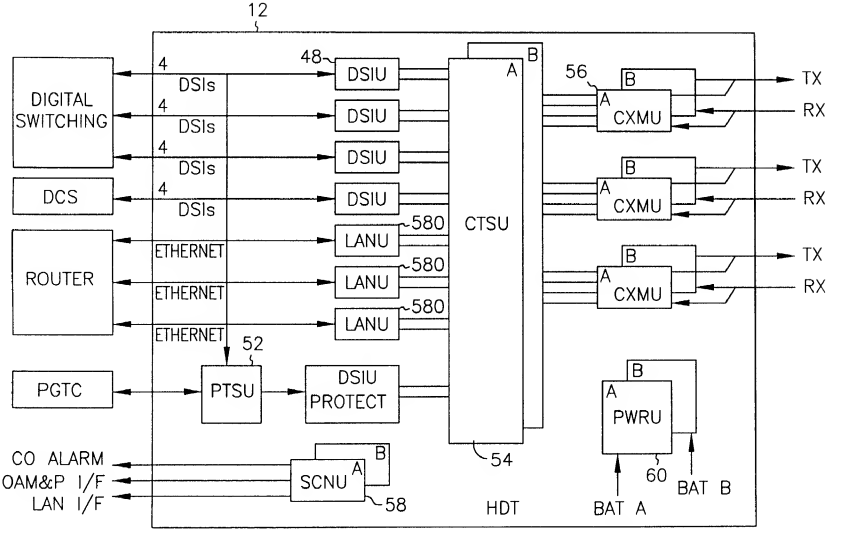


FIG. 97

T0660/0 A/ET0660

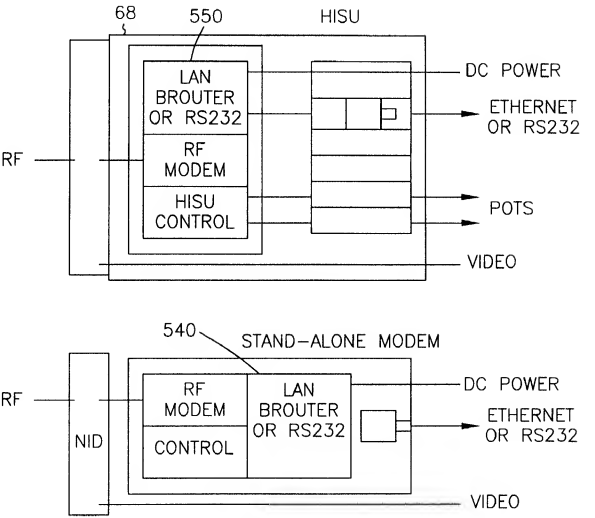


FIG. 98

T06020"4ZET0660

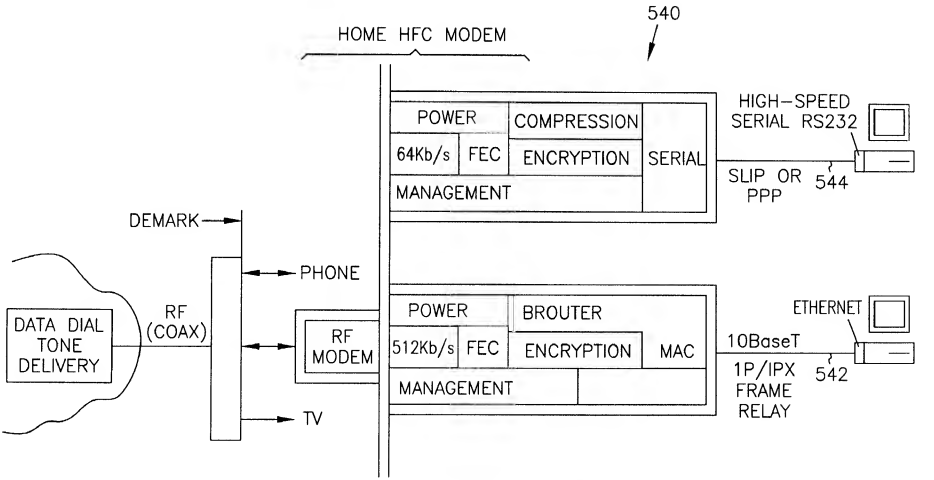


FIG. 99

T0660 WO2T0660

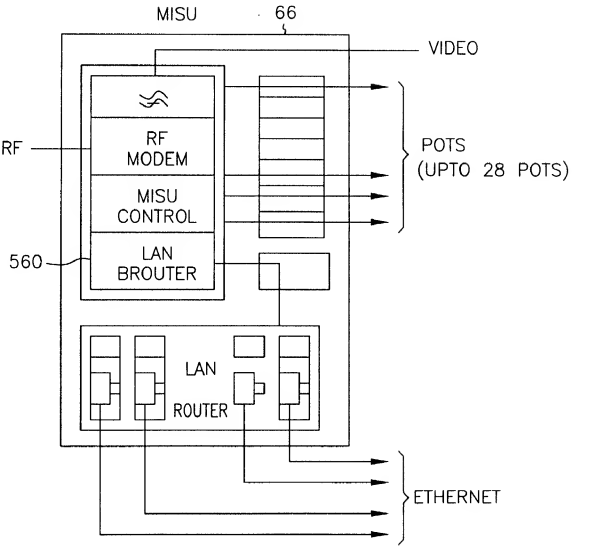


FIG. 100

TD6020 "4ZCT0660

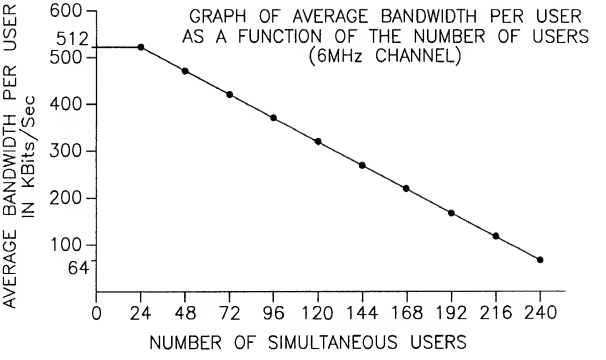


FIG. 101

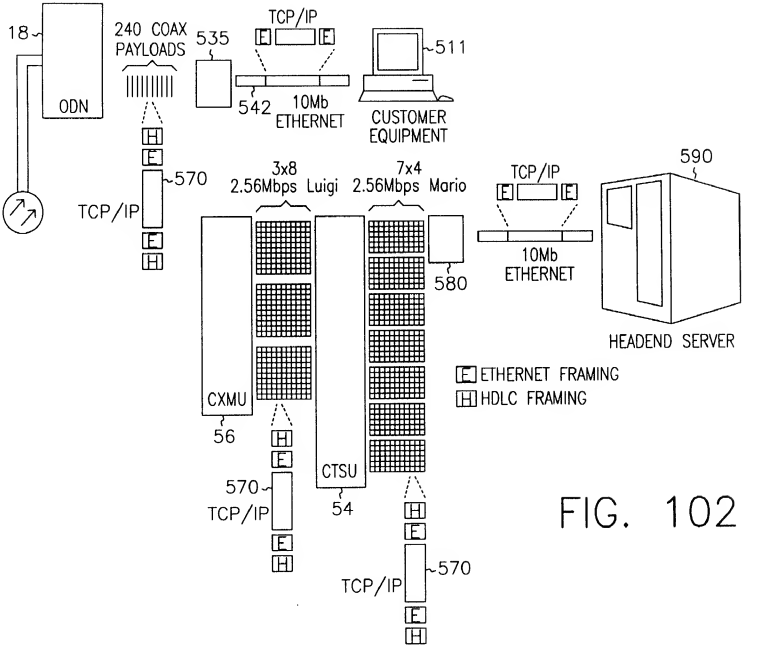

18
ODN
240 COAX PAYLOADS
535
TCP/IP
542
10Mb ETHERNET
511
CUSTOMER EQUIPMENT
570
TCP/IP
3x8 2.56Mbps Luigi
7x4 2.56Mbps Mario
580
590
HEADEND SERVER
ETHERNET FRAMING
HDLC FRAMING
CXMU
56
CTSU
54

FIG. 102

TO66020 WO/ET0660

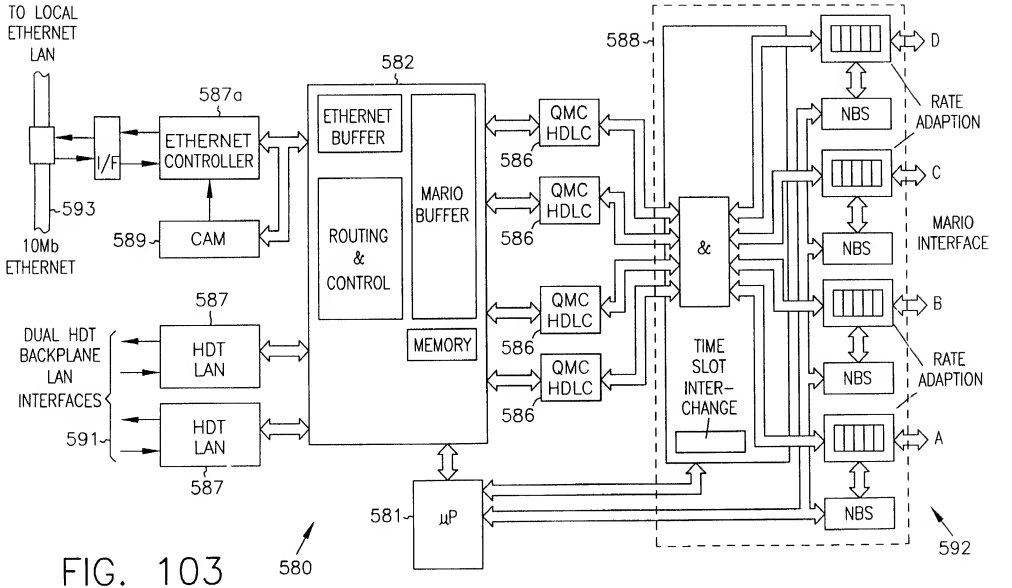


FIG. 103

D66020 "4CT0660

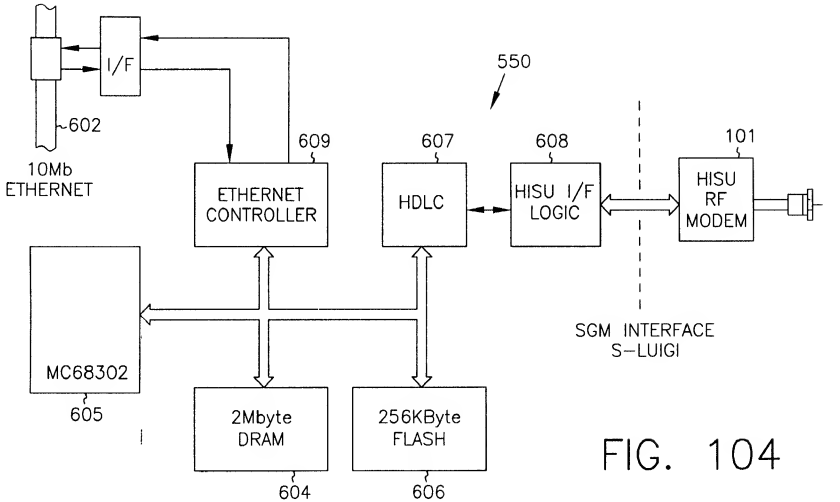


FIG. 104

T06020 "nZETO660

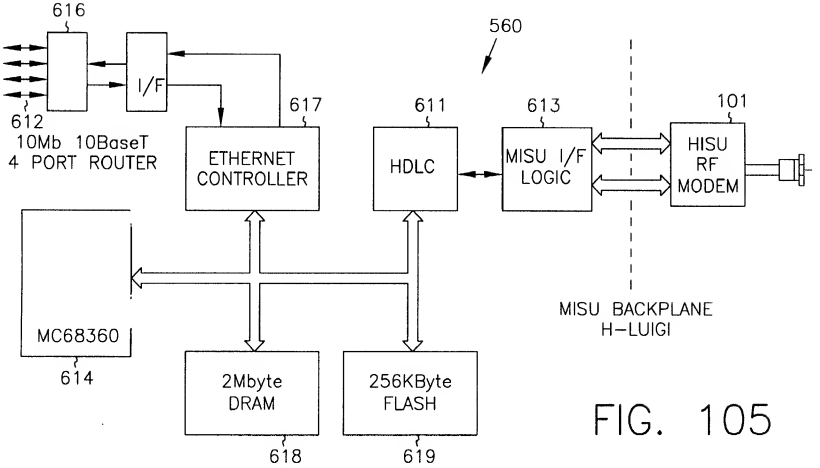


FIG. 105

T06020 "4278660

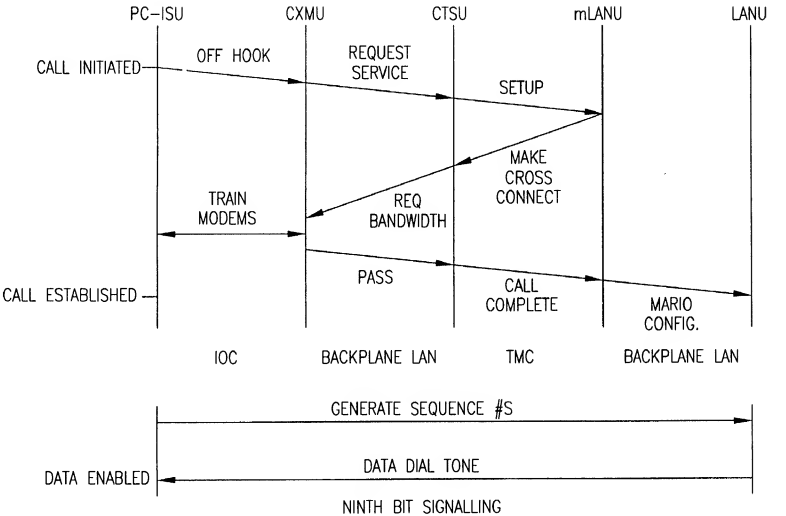


FIG. 106

Patent Application Publication

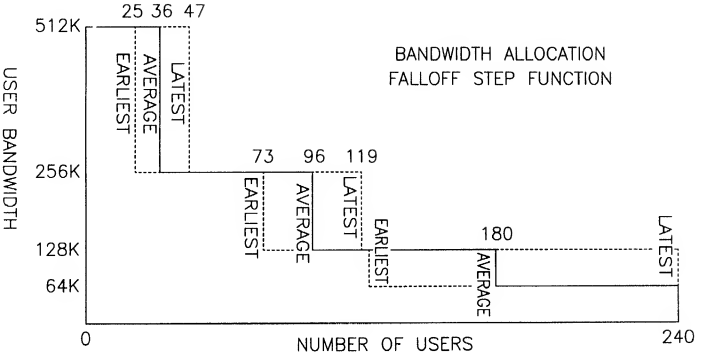
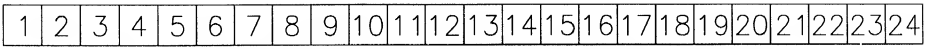
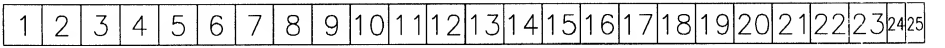


FIG. 107

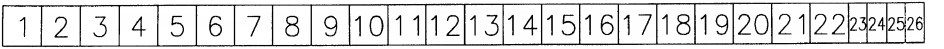
D66626 "4678660



THE RF SPECTRUM OF 24 USERS WITH 512Kbs



ADDING THE 25th USER



ADDING THE 26th USER, ETC

FIG. 108

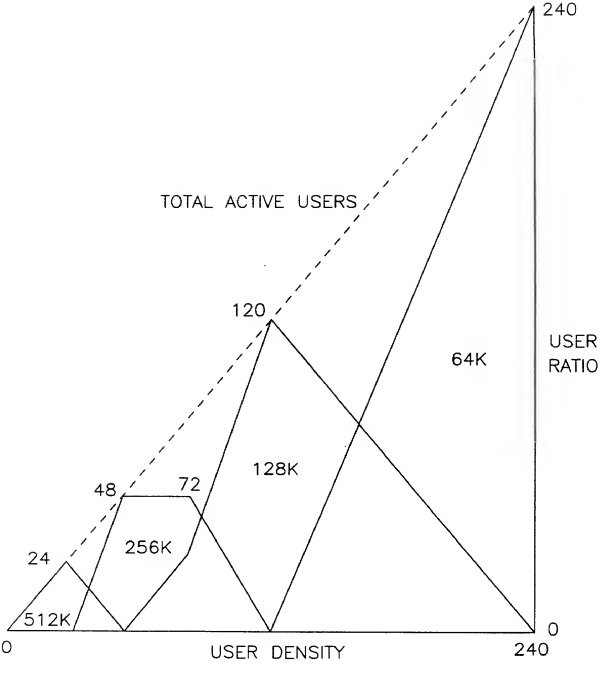

240
TOTAL ACTIVE USERS
120
64K
USER
RATIO
128K
48
72
24
256K
512K
0
0
USER DENSITY
240

FIG. 109

T06020 "62ET0660

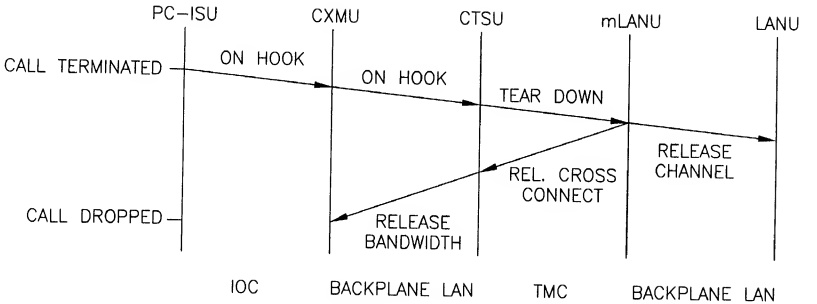


FIG. 110

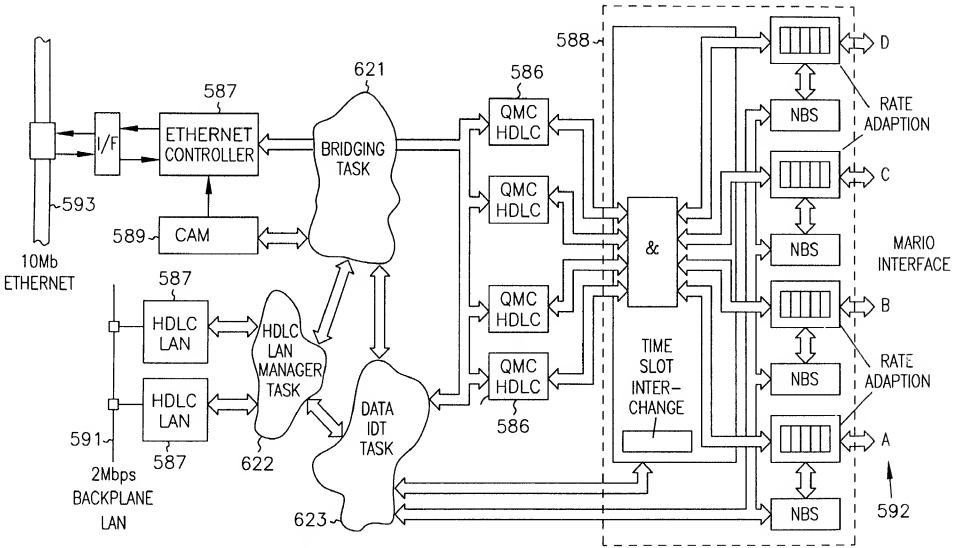

588
621
586
587
ETHERNET CONTROLLER
I/F
BRIDGING TASK
QMC HDLC
QMC HDLC
QMC HDLC
QMC HDLC
586
593
589
CAM
10Mb ETHERNET
587
HDLC LAN
HDLC LAN
HDLC LAN MANAGER TASK
DATA IDT TASK
591
587
622
623
2Mbps BACKPLANE LAN
&
TIME SLOT INTER-CHANGE
D
C
B
A
NBS
NBS
NBS
NBS
RATE ADAPTION
RATE ADAPTION
MARIO INTERFACE
592

FIG. 111

620

EP 0660270 A2

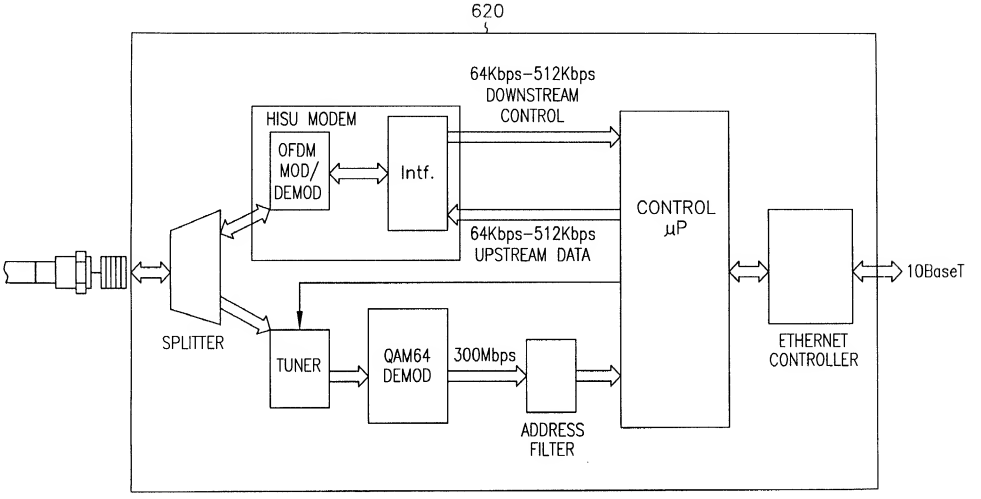


FIG. 112

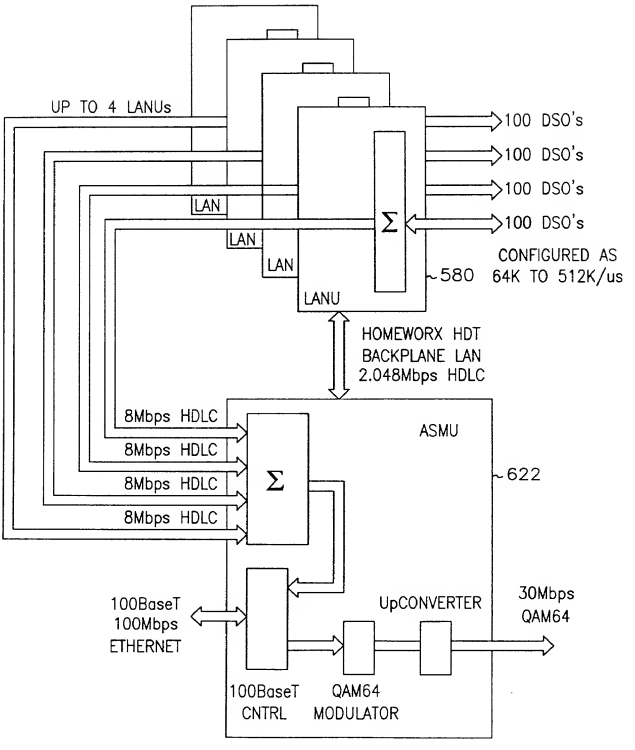

UP TO 4 LANUs
100 DSO's
100 DSO's
100 DSO's
100 DSO's
LAN
LAN
LAN
Σ
CONFIGURED AS
64K TO 512K/us
~580
LANU
HOMEWORX HDT
BACKPLANE LAN
2.048Mbps HDLC
8Mbps HDLC
8Mbps HDLC
8Mbps HDLC
8Mbps HDLC
Σ
ASMU
~622
100BaseT
100Mbps
ETHERNET
UpCONVERTER
30Mbps
QAM64
100BaseT
CNTRL
QAM64
MODULATOR

FIG. 113

TG60207 <ET0660

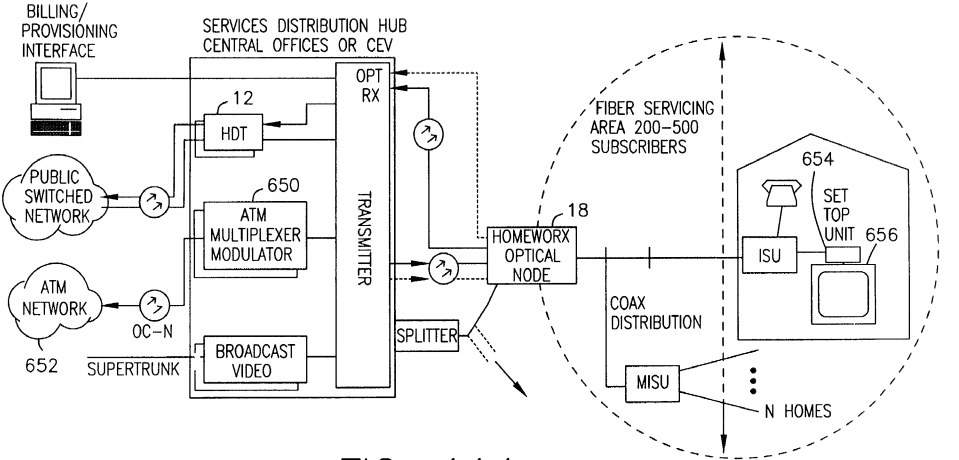


FIG. 114

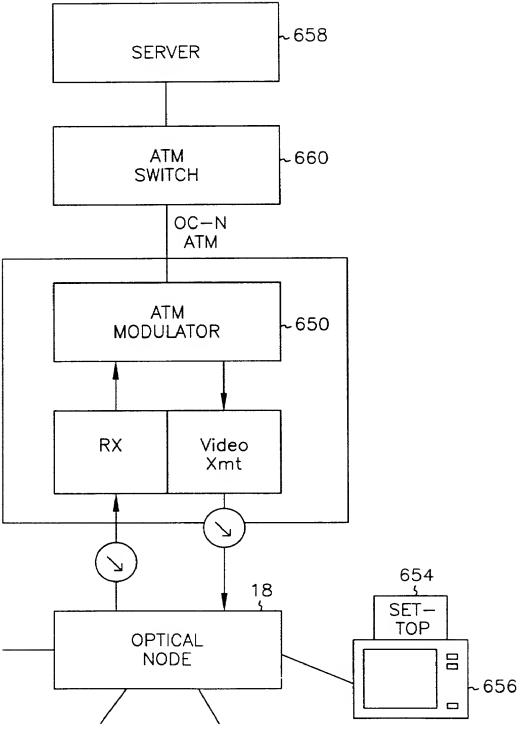

SERVER
658
ATM
SWITCH
660
OC–N
ATM
ATM
MODULATOR
650
RX
Video
Xmt
18
654
SET–
TOP
OPTICAL
NODE
656

FIG. 115

D660207 "62D660

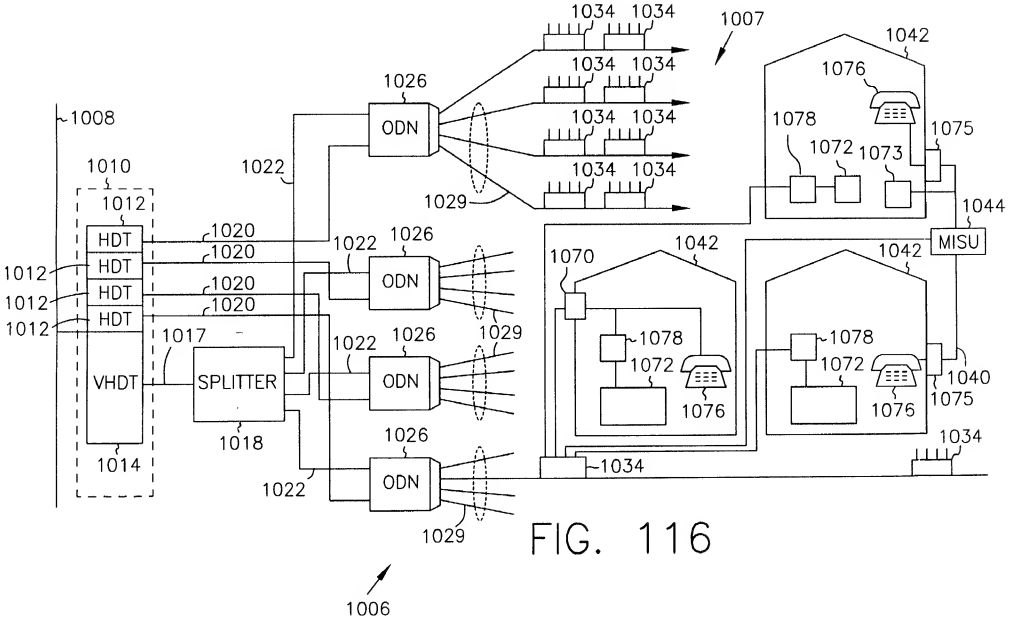


FIG. 116

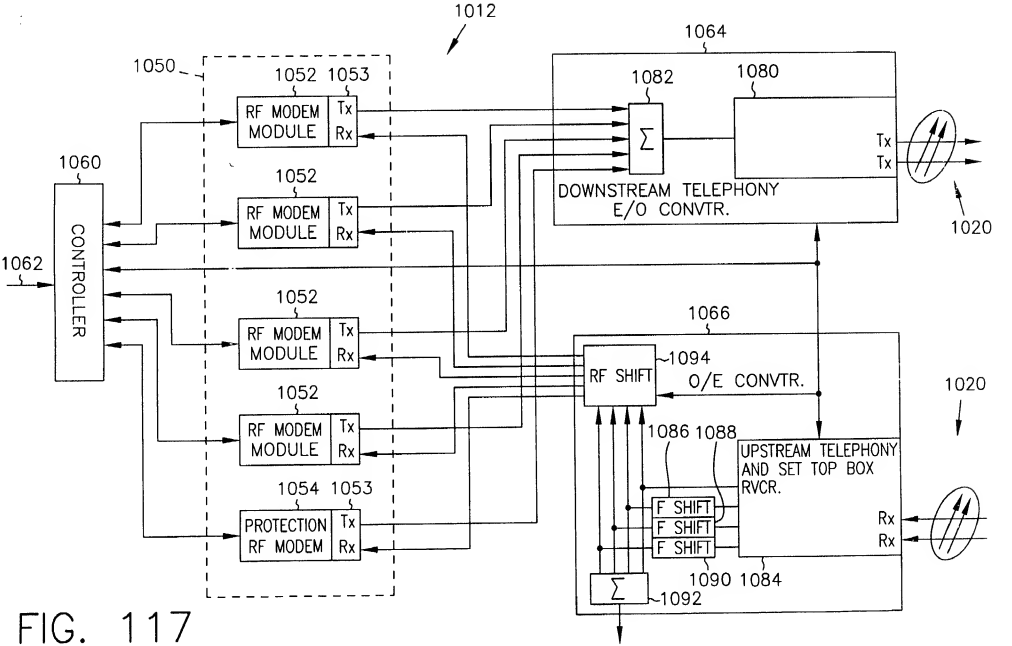

1012
1064
1050
1052 1053
1082
1080
RF MODEM MODULE
Tx
Rx
Σ
Tx
Tx
DOWNSTREAM TELEPHONY E/O CONVTR.
1020
1060
1052
CONTROLLER
1062
1066
1052
1094
RF SHIFT
O/E CONVTR.
1020
1052
1086 1088
UPSTREAM TELEPHONY AND SET TOP BOX RVCR.
1054 1053
PROTECTION RF MODEM
F SHIFT
F SHIFT
F SHIFT
Rx
Rx
1090 1084
Σ
1092

FIG. 117

T0600/0 WZET066D

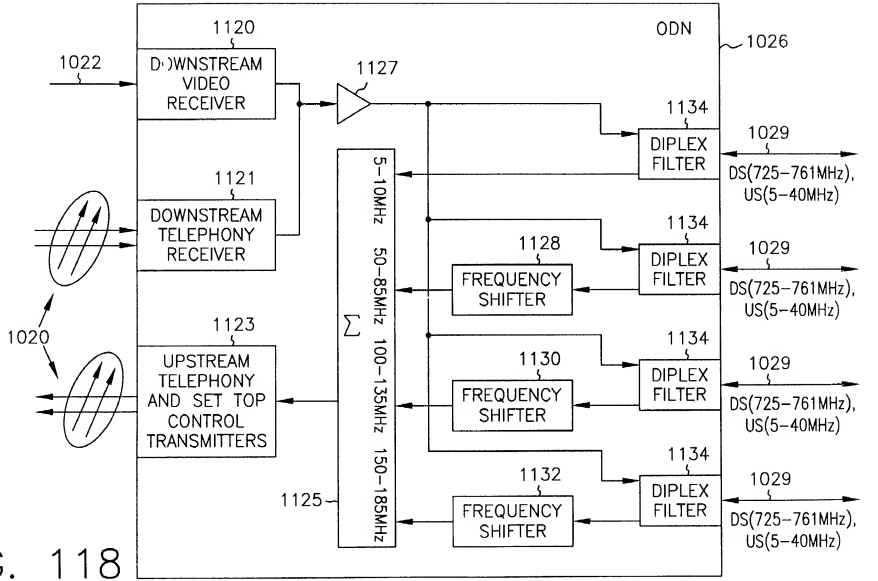


FIG. 118

T06020 "WZ2T0660

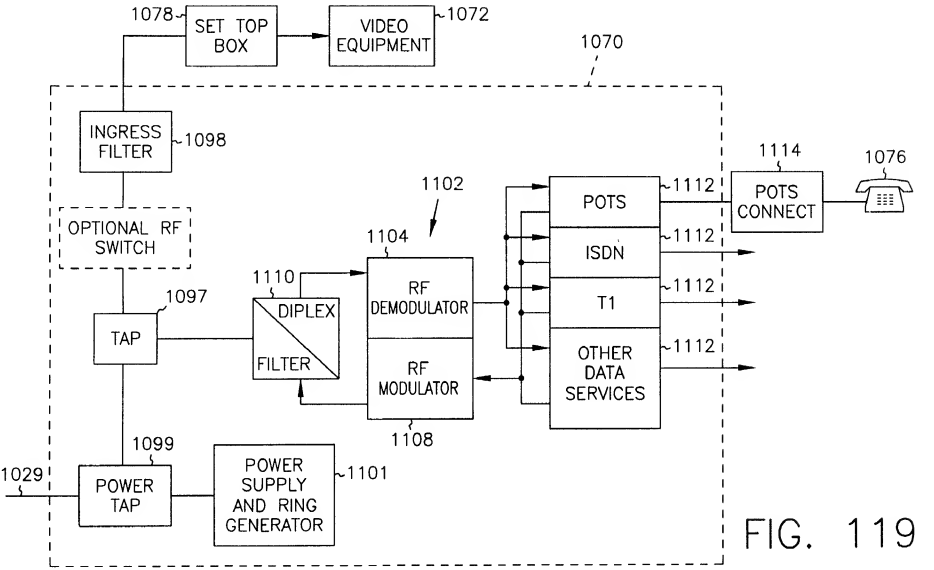


FIG. 119

T060/0 4/2E T060

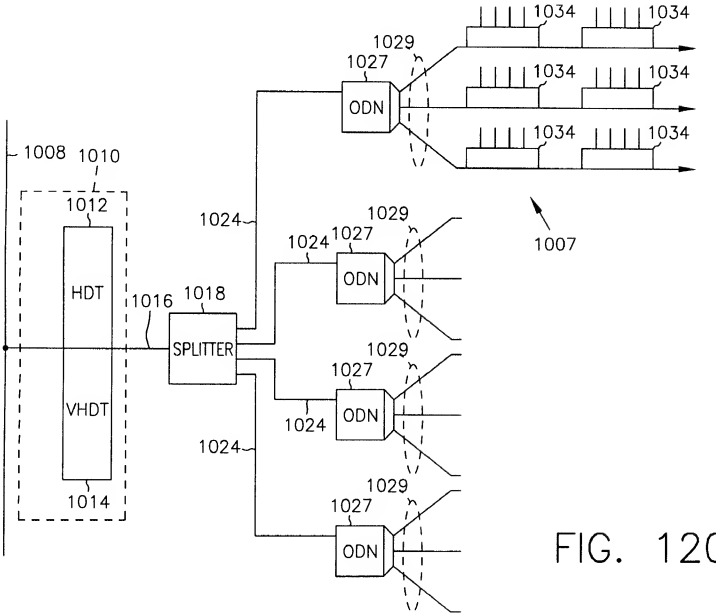


FIG. 120

T0600 "4ET0660

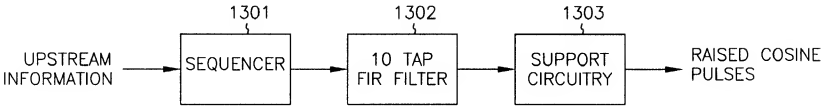


FIG. 121

T060620 h2270660

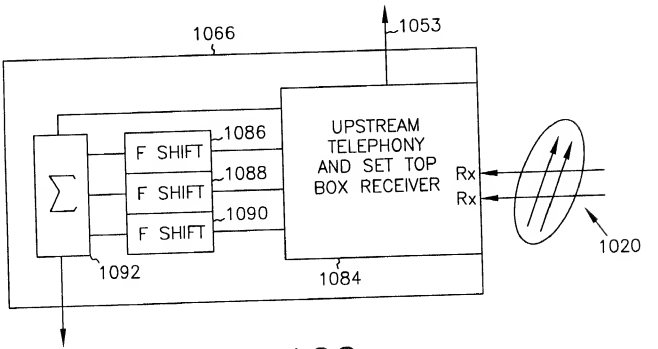


FIG. 122

TABOOA1 1/27/0660

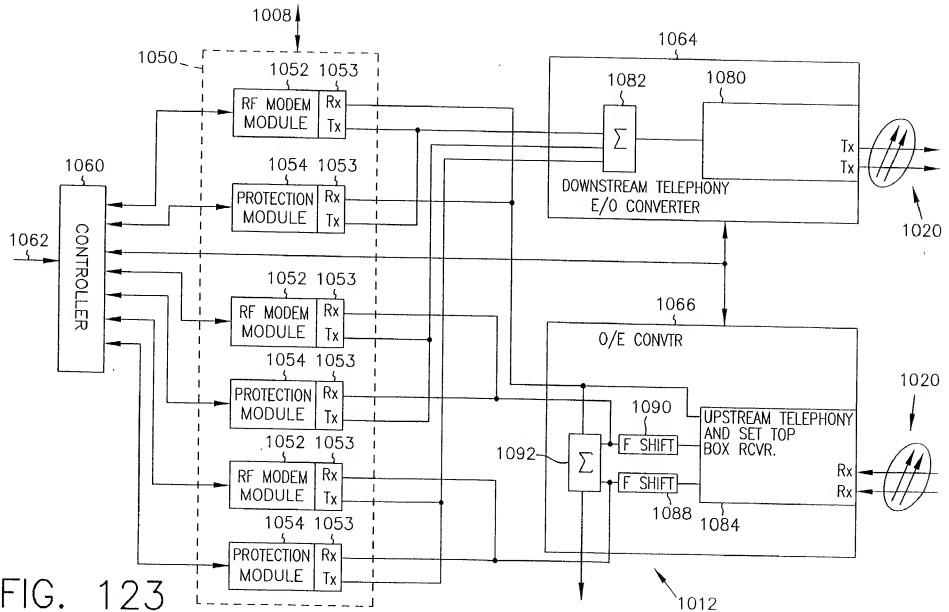


FIG. 123